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**PAYLOAD AND TRAJECTORY DATA
FOR GSFC NIKE APACHE FIRINGS
JULY THROUGH DECEMBER 1965
TRACKED BY RADAR**

MARCH 1967

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GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

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ABBREVIATIONS AND SYMBOLS
FOR SOUNDING ROCKET DOCUMENTS

Abbreviations:

AFCRL	- Air Force Cambridge Research Laboratory, Bedford, Mass.
AIL	- Airborne Instruments Laboratory, Melville, Long Island, N. Y.
AS&E	- American Science and Engineering, Inc., Cambridge, Mass.
BRL	- Ballistic Research Laboratories, Aberdeen, Md.
BuStd	- National Bureau of Standards, Boulder, Colo.
CRPL	- Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colo.
DRTE	- (Canadian) Defense Research Telecommunications Establishment, Ottawa, Canada
Dudley	- Dudley Observatory, Albany, N. Y.
Ga. Tech.	- Georgia Institute of Technology, Atlanta, Ga.
GCA	- Geophysics Corporation of America, Bedford, Mass.
Harvard	- Harvard College, Cambridge, Mass.
JHU	- Johns Hopkins University, Baltimore, Md.
JPL	- Jet Propulsion Laboratory, Pasadena, Calif.
LaRC	- NASA, Langley Research Center, Hampton, Va.
LeRC	- NASA, Lewis Research Center, Cleveland, Ohio
Lockheed	- Lockheed Missiles and Space Division, Palo Alto, Calif.
NCAR	- National Center for Atmospheric Research, Boulder, Colo.
NRL	- Naval Research Laboratory, Washington, D. C.
NYU	- New York University, New York, N. Y.
Rice	- Rice University, Houston, Texas
SCAS	- Southwest Center for Advanced Studies, Dallas, Texas
Stanford	- Stanford Research Institute, Menlo Park, Calif.
U. Colo.	- University of Colorado, Boulder, Colo.

- U. Ill. - University of Illinois, Urbana, Ill.
- U. Mich. - University of Michigan, Ann Arbor, Mich.
- U. Minn. - University of Minnesota, Minneapolis, Minn.
- UNH - University of New Hampshire, Durham, N.H.
- U. Wisc. - University of Wisconsin, Madison, Wisc.
- Varian - Varian Associates, Palo Alto, Calif.

Firing Sites:

- ARG - Chamical, Argentina
- ASC - Ascension Island
- AUS - Woomera, Australia
- BRZ - Natal, Brazil
- EGL - Eglin Air Force Base, Florida
- FC - Fort Churchill, Canada
- IND - Thumba, India
- Italy - Sardinia, Italy
- NOR - Andoya, Norway
- NZ - Karikari, New Zealand
- PB - Point Barrow, Alaska
- PMR - Pacific Missile Range
- PAK - Karachi, Pakistan
- SWE - Kronogard, Sweden
- SUR - Coronie, Surinam
- WI - Wallops Island, Virginia
- WIMR - Wallops Island Mobile Range, W.I., Virginia
- WS - White Sands Missile Range, New Mexico

Numbering System:

NASA	1.—Aerobee 100	10.—Nike Cajun
	2.—Arcon	11.—Argo D-8
	3.—Nike Asp	12.—Special projects
	4.—Aerobee 150, 150 A	14.—Nike Apache
	5.—Iris	15.—Arcas
	6.—Aerobee 300	16.—Astrobee 1500
	7.—Argo E-5	17.—Aerobee 350
	8.—Argo D-4	18.—Nike Tomahawk
	9.—Skylark	

Numbers following the decimal point indicate chronological order of assignment to Goddard missions.

Identifying Letters:

The letters which follow each rocket number identify -

- (1) the instrumenting agency, and
- (2) the experiment, according to the following list:

1. Agency

G - Goddard
N - Other NASA centers
U - College or university
D - Department of Defense
A - Other government agency
C - Industrial corporations
I - International

2. Experiment

A - Aeronomy
E - Energetic particles and fields
I - Ionospheric physics
S - Solar physics
G - Galactic astronomy
R - Radio astronomy
B - Biological
P - Special projects
T - Test and support
M - Meteorology

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The Nike Apache, a two-stage solid-propellant unguided sounding rocket, is stabilized by four fins (on each of the two stages) arranged in a cruciform configuration.

A conical transition section bolted to the first stage slip-fits into the nozzle of the second stage. At first-stage burnout, differential drag forces separate the stages as no mechanical restraint in the axial direction exists between the second stage and the transition assembly. Second-stage ignition is normally delayed for 16.5 seconds after first-stage burnout in order to reduce aerodynamic heating and drag in the low-altitude, high-density region.

Of 28 Nike Apaches fired by Goddard Space Flight Center from July through December 1965, 9 were tracked by radar. Table 1 lists payload and launch data for these rockets.

Figure 1 shows the four standard drag configurations of Nike Apaches used by GSFC. Many payloads, however, do not conform to these standards. Figures 2 through 63 consist of a photograph of the payload configuration of each rocket tracked by radar, followed by its radar plots. Figure 9 is a sketch of Nike Apache 14.78 UA, flown from White Sands, New Mexico, which did not conform to any of the standard configurations.

Table 1
Nike Apache Rockets Fired from July through December 1965 Tracked by Radar

ROCKET NUMBER	LAUNCH DATE	LAUNCH SITE	PAYLOAD WEIGHT (lbs)	PAYLOAD LENGTH (in)	PREDICTED ELEVATION (degrees)	LAUNCH ANGLE AZIMUTH (degrees)	RADAR	SCIENTIST	EXPERIMENT
14. 75 GR	G2-2201	WI	63. 5	60. 0	80. 1	96. 5	FPS-16; FPQ-6	Stone	Radio Propagation
14. 78 UA		WS	115. 0	80. 0	85. 0	0	FPS-16E- R-112; R-123	Dudley Dubin	Micro- meteorite
14. 133 NA	G2-2195	WI	84. 5	73 7/8	80. 0	95. 0	FPS-16; FPQ-6	LeRC Potter	Airglow
14. 210 GI	G2-2350	WI	64. 5	78. 0	84. 0	110. 0	FPS-16; FPQ-6	Bourdeau	Ionospheres
14. 213 UI	G2-2348	WI	79. 5	77. 5	83. 1	125. 0	FPS-16; FPQ-6	SCAS Schmerling	Ionospheres
14. 214 UI	G2-2349	WI	80. 0	77. 5	84. 0	130. 0	FPS-16; FPQ-6	SCAS Schmerling	Ionospheres
14. 242 UE	G2-2369	WI	50. 5	78. 75	77. 0	85. 0	FPS-16; FPQ-6	Rice Opp	Magnetic fields
14. 244 UI	G2-2370	WI	55. 0	67. 0	80. 0	100. 0	FPQ-6	U. Ill. Schmerling	IQSY Ionospheres
14. 247 UI	G2-2371	WI	50. 5	66. 4	80. 0	100. 0	FPQ-6	U. Ill. Schmerling	Iono. Radio and Physics

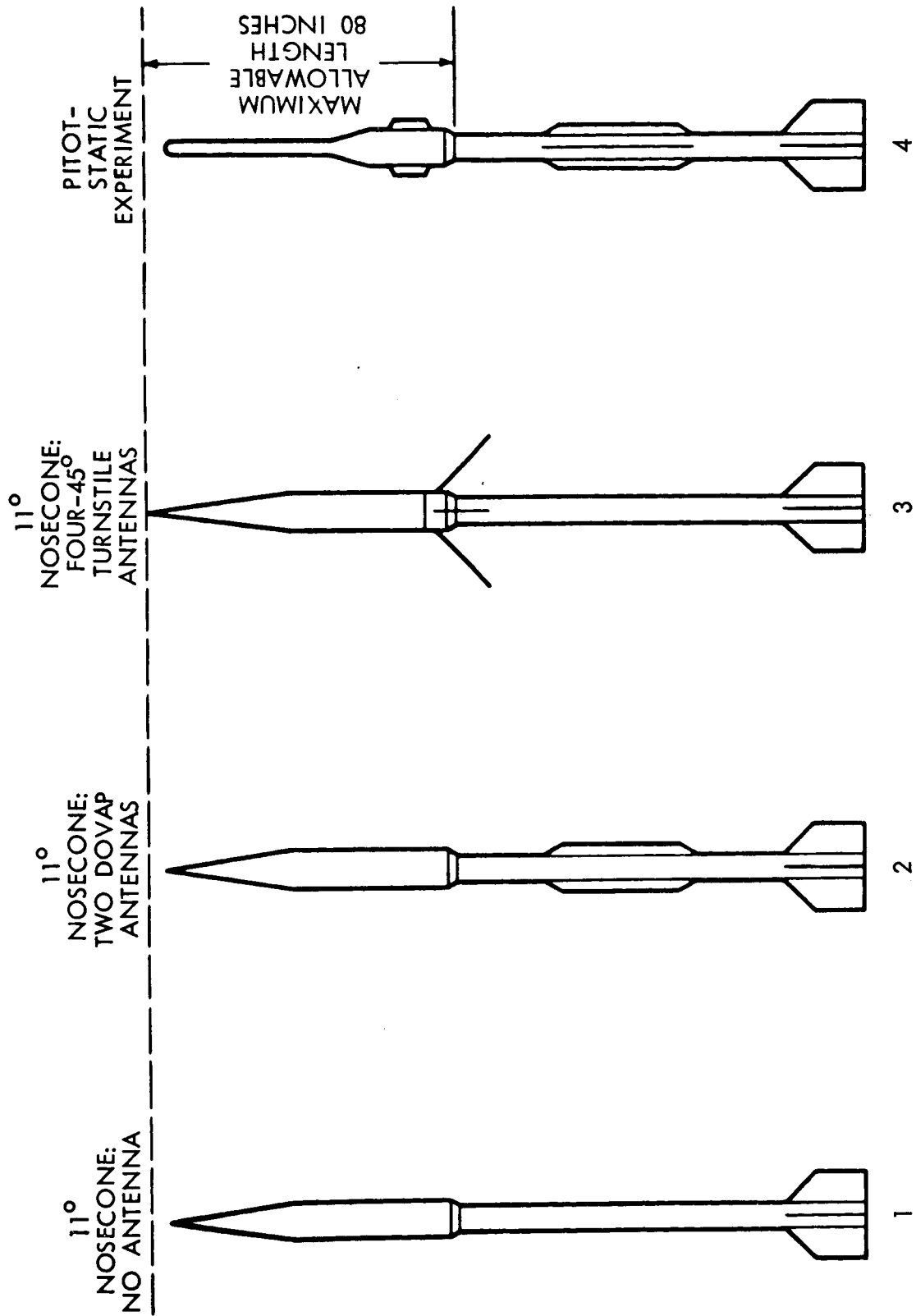


Figure 1. Standard Drag Cases

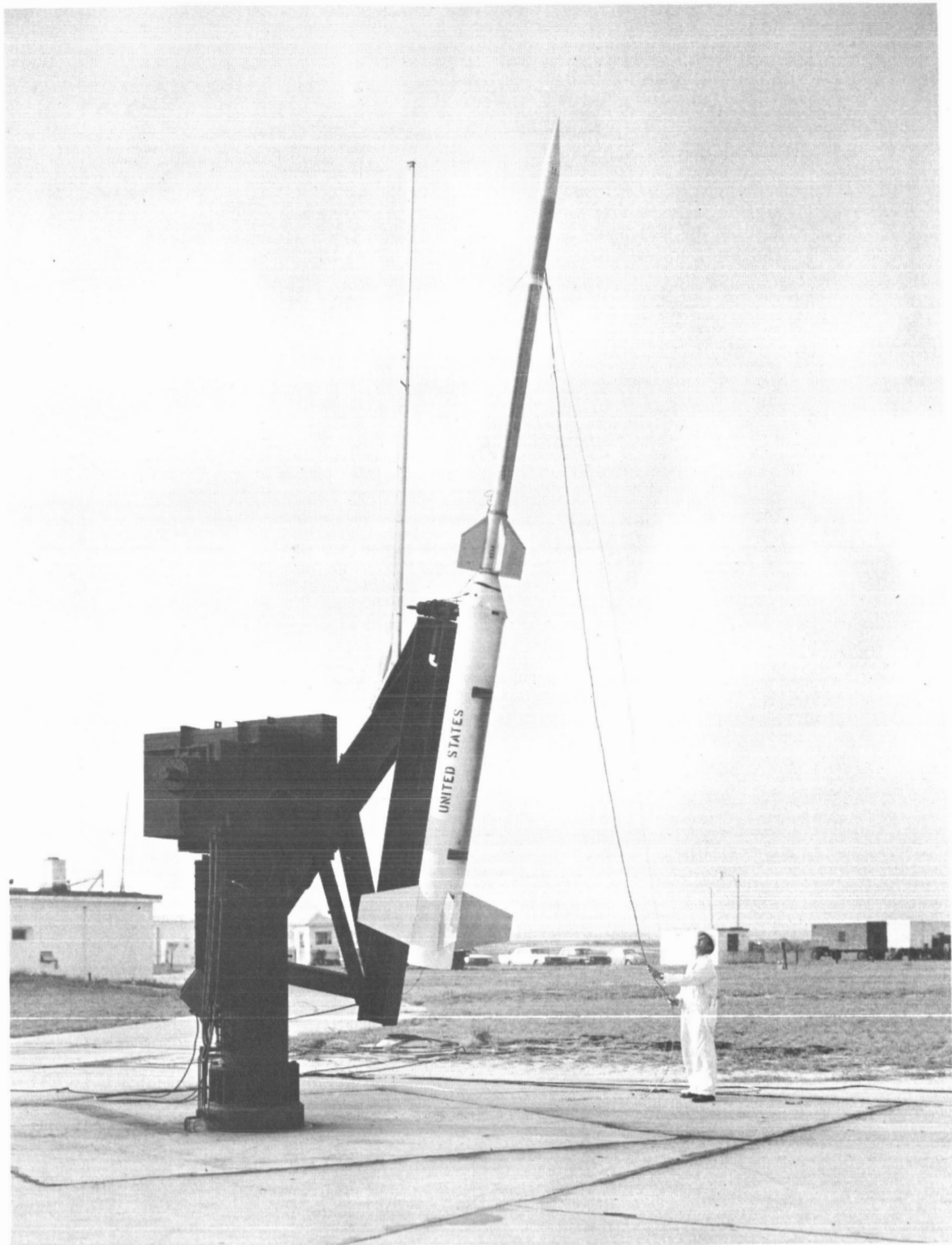


Figure 2. 14.75 GR Photograph

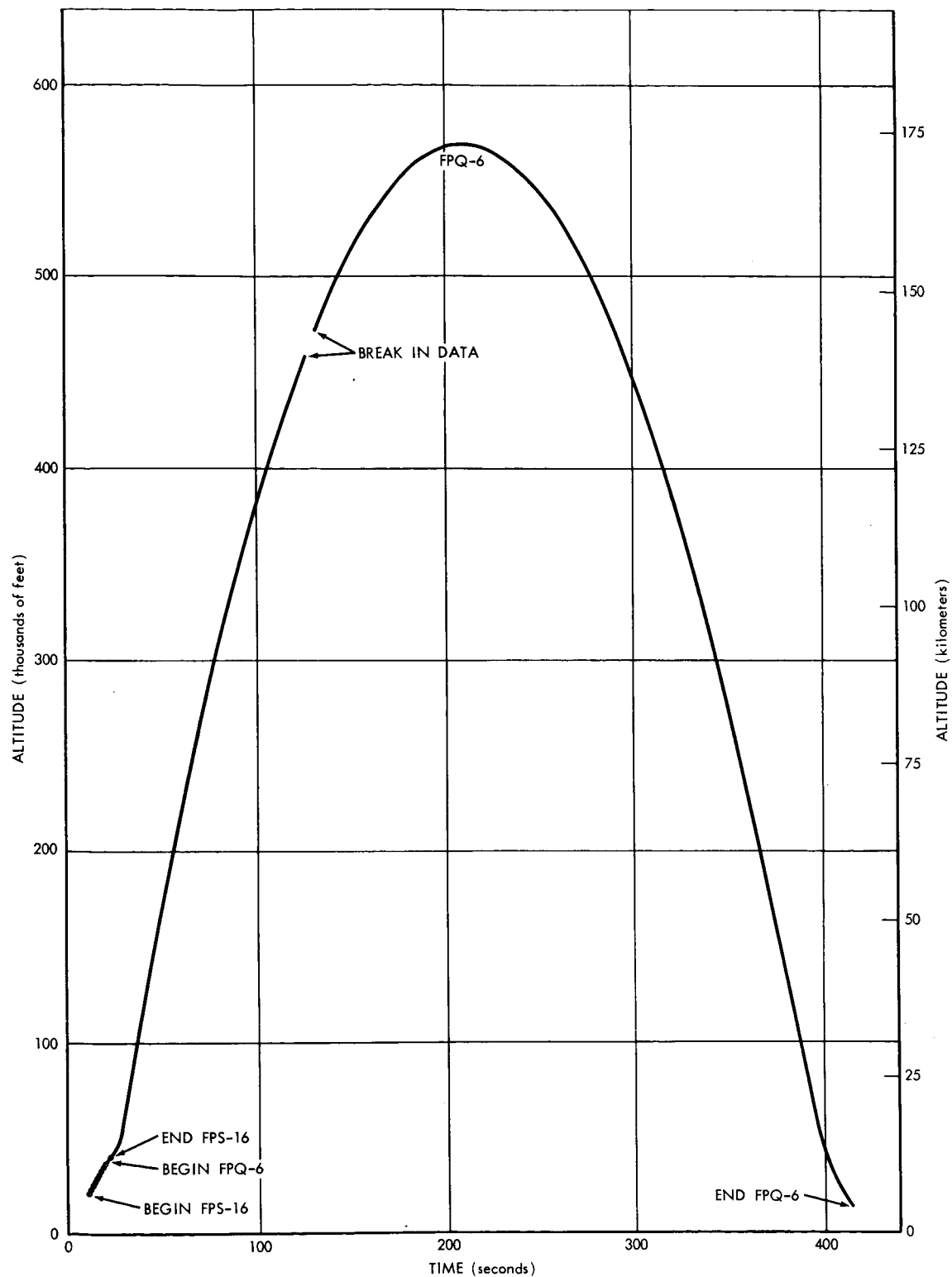


Figure 3. 14.75 GR Radar Plot, Altitude vs Time

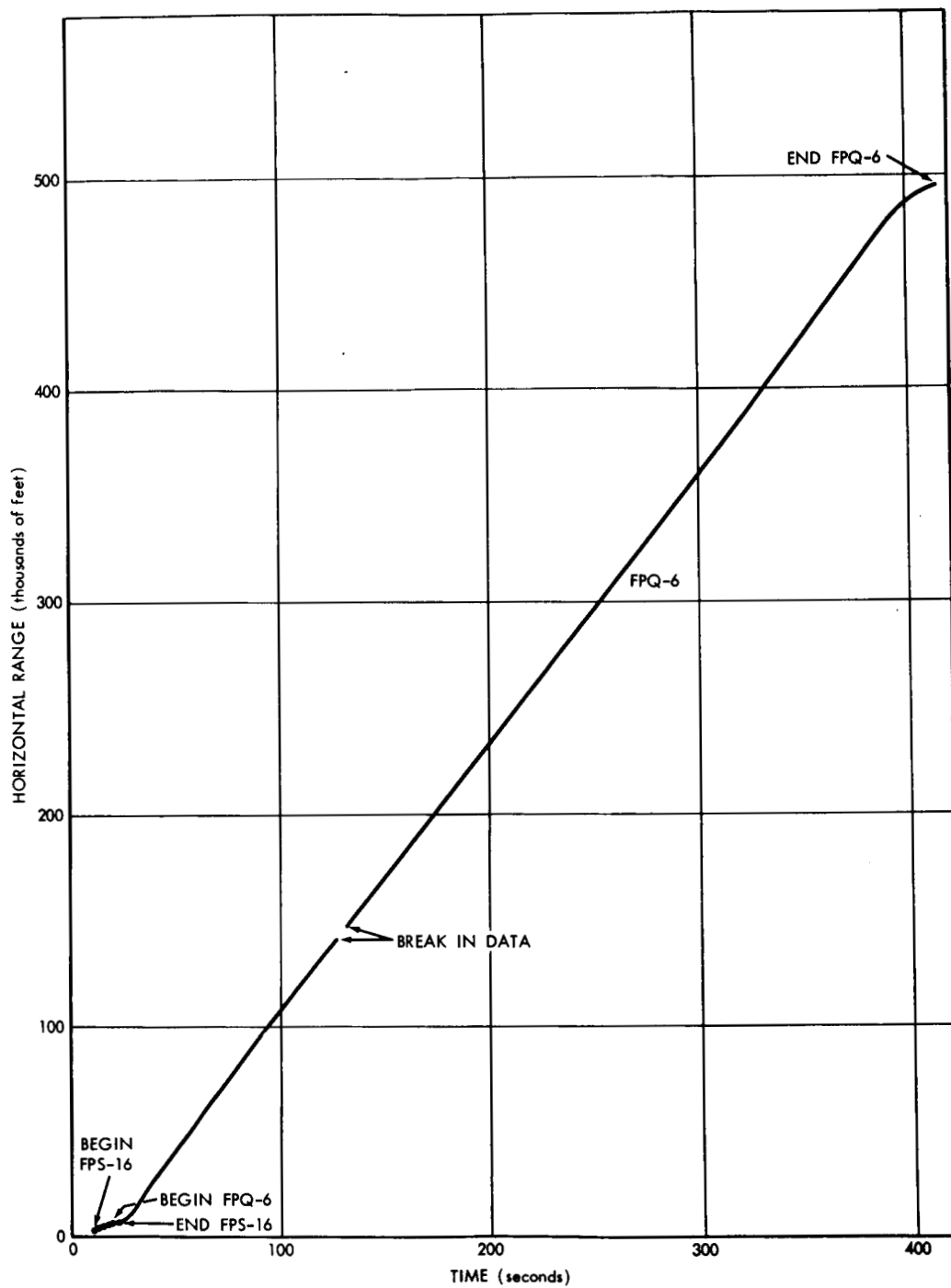


Figure 4. 14.75 GR Radar Plot, Horizontal Range vs Time

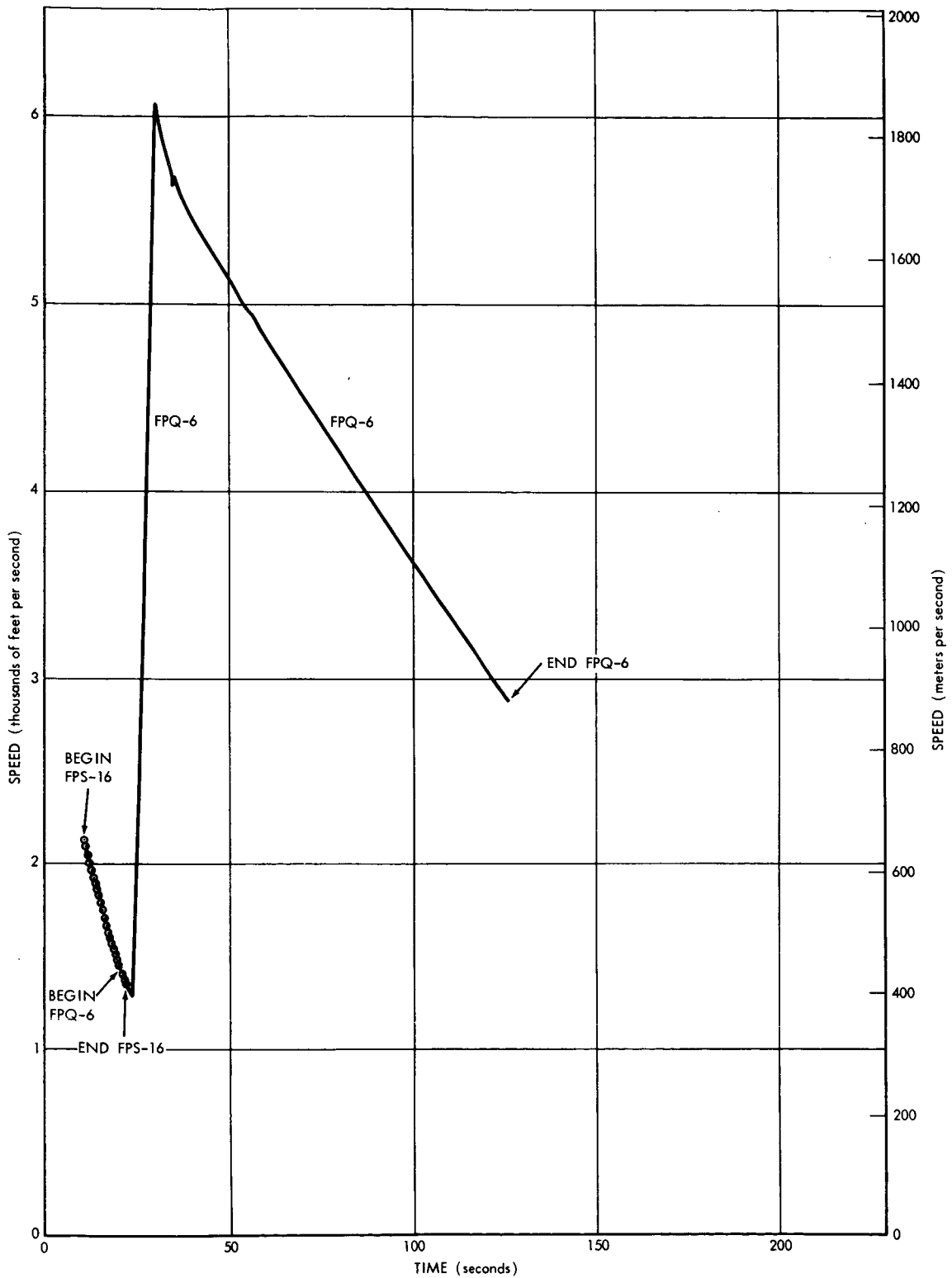


Figure 5. 14.75 GR Radar Plot, Speed vs Time

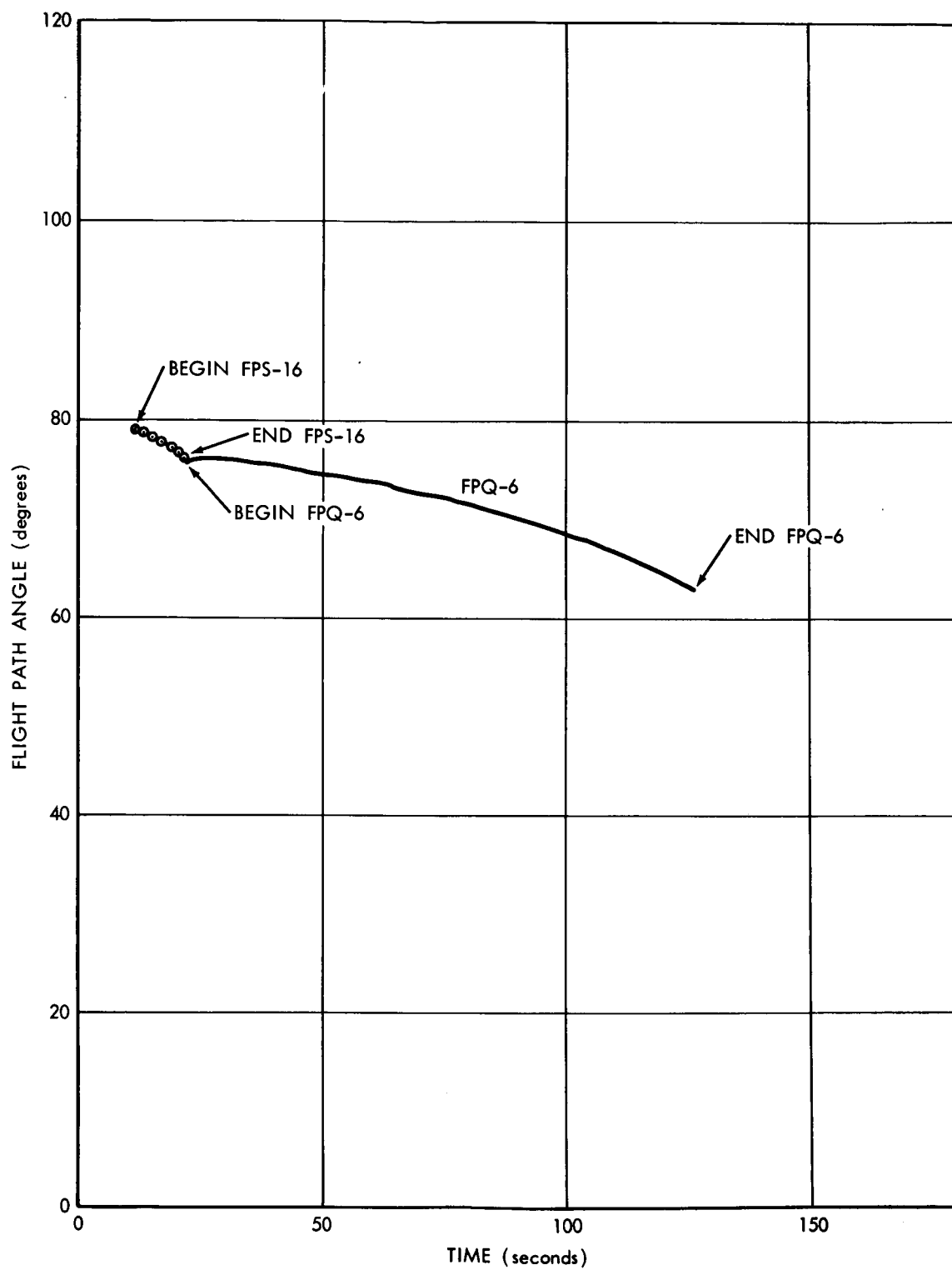


Figure 6. 14.75 GR Radar Plot, Flight Path Angle vs Time

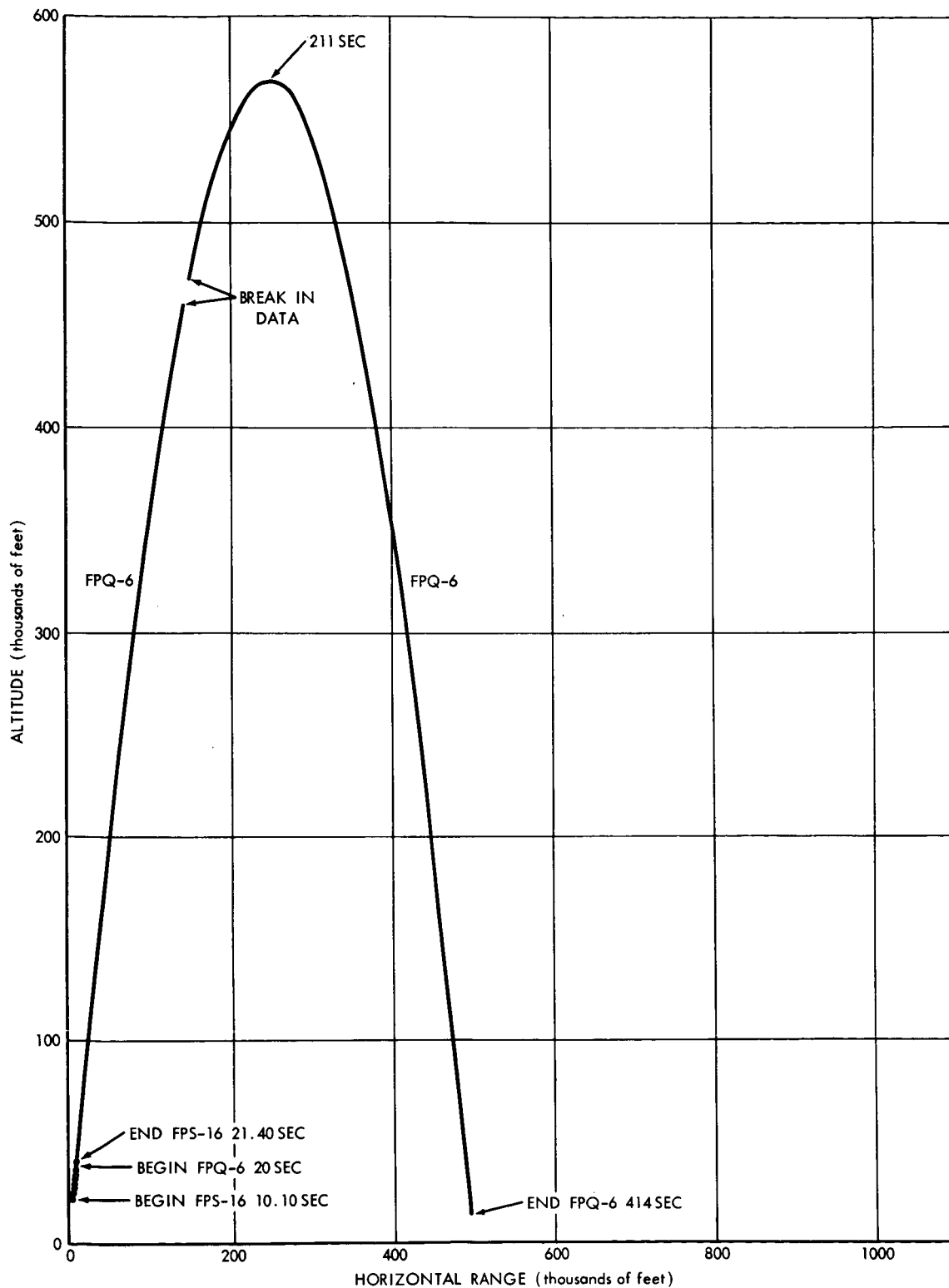


Figure 7. 14.75 GR Radar Plot, Altitude vs Horizontal Range

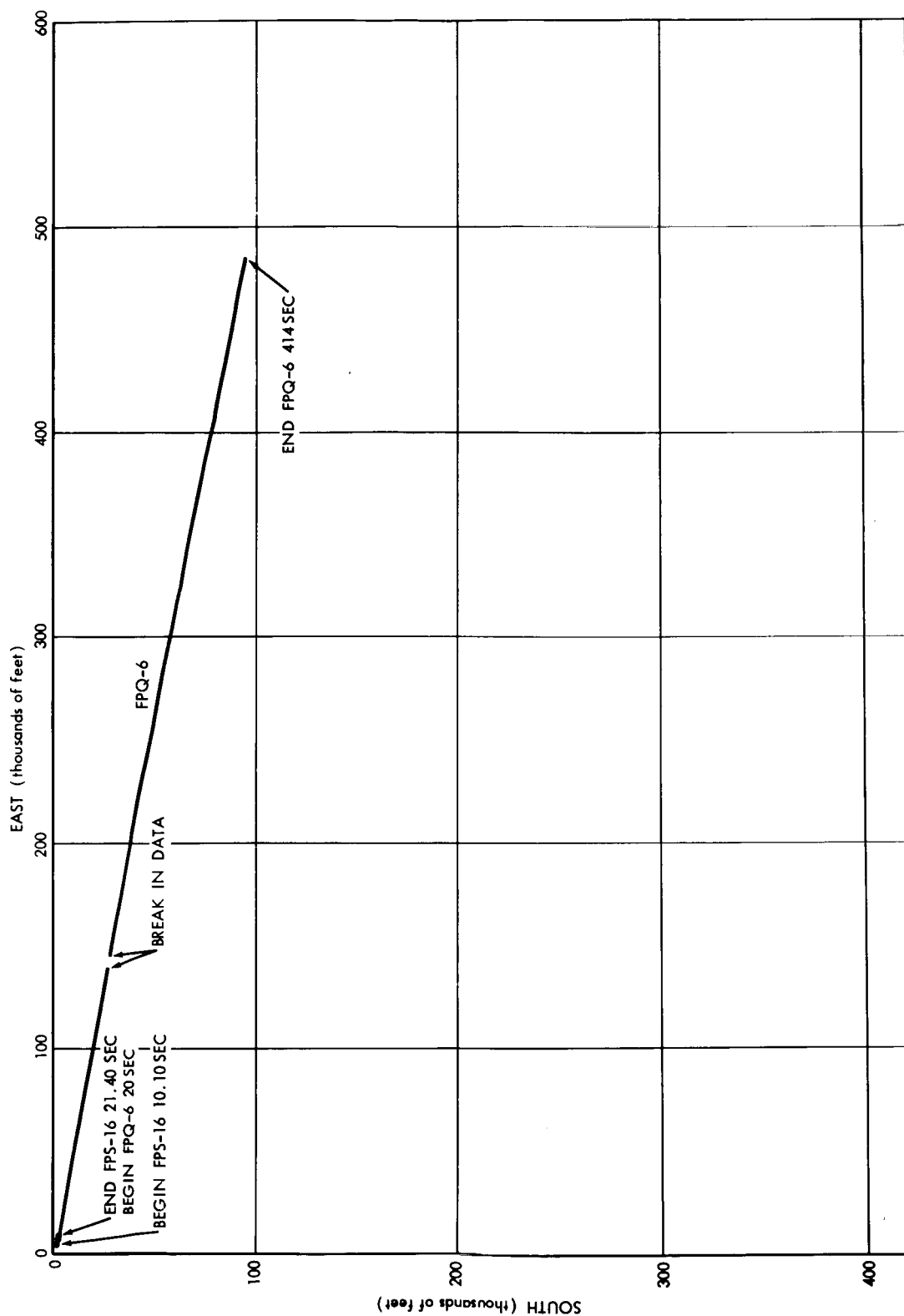


Figure 8. 14.75GR Radar Plot, South Range vs East Range

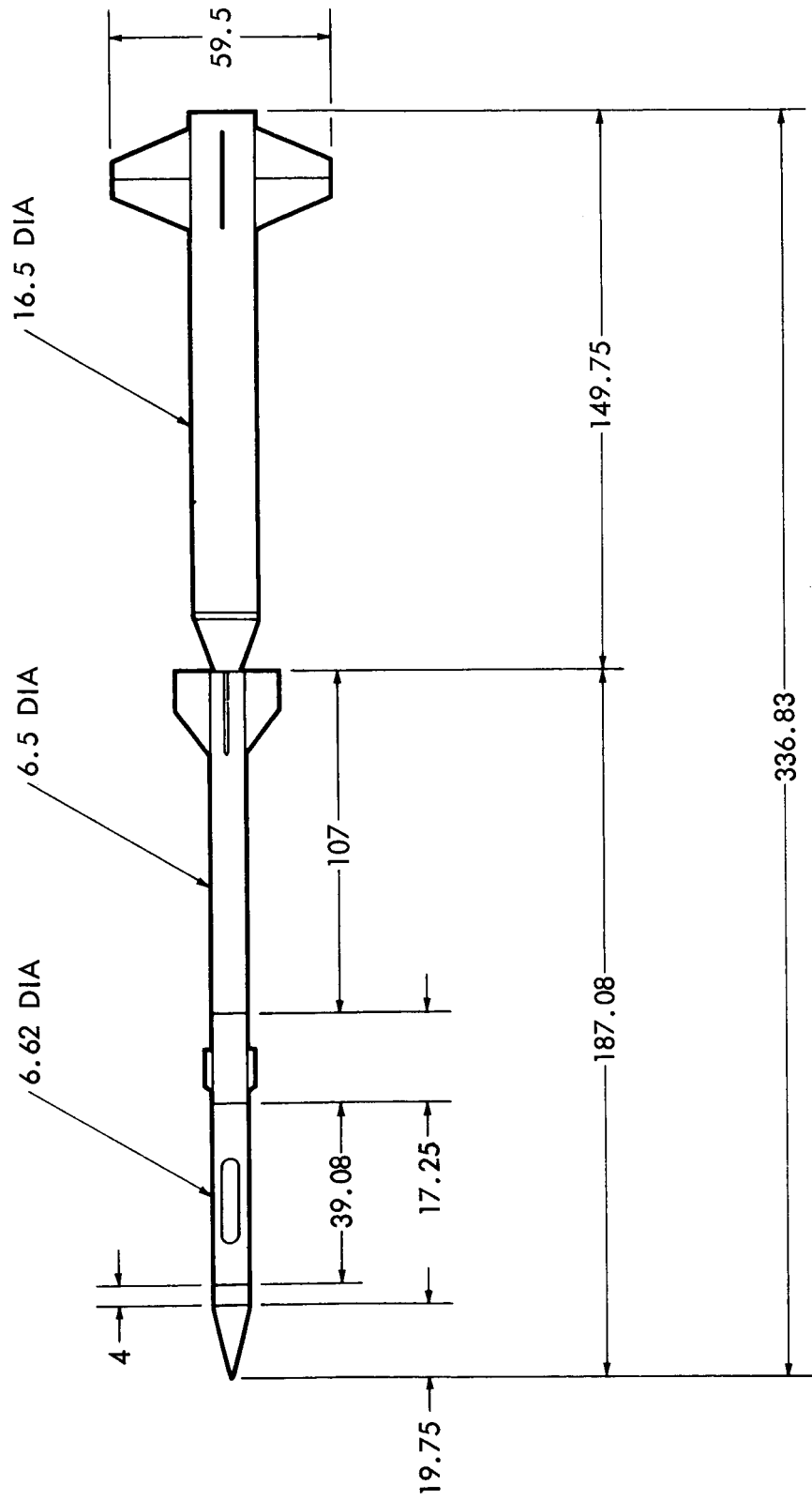


Figure 9. 14.78 UA Sketch

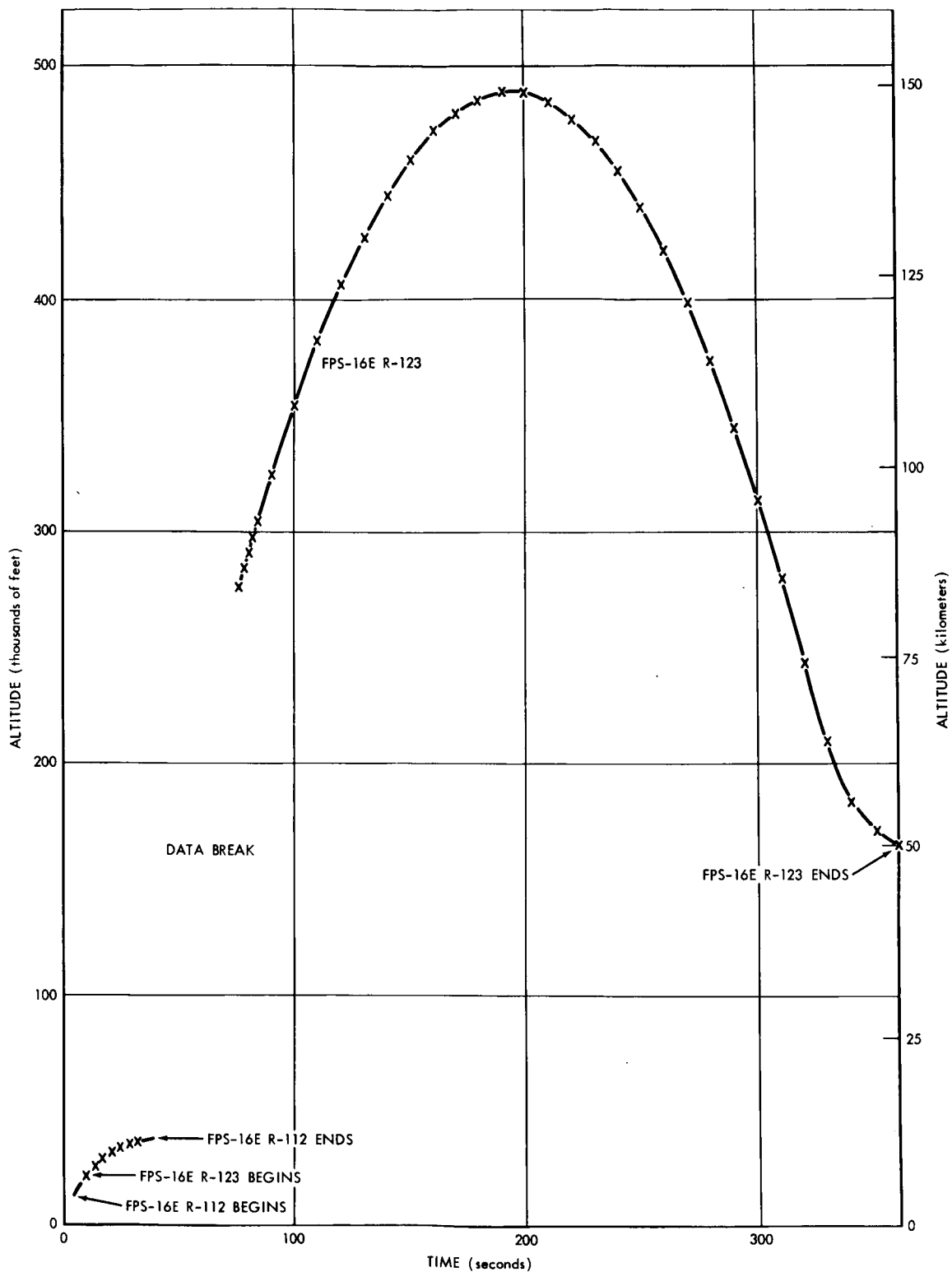


Figure 10. 14.78 UA Radar Plot, Altitude vs Time

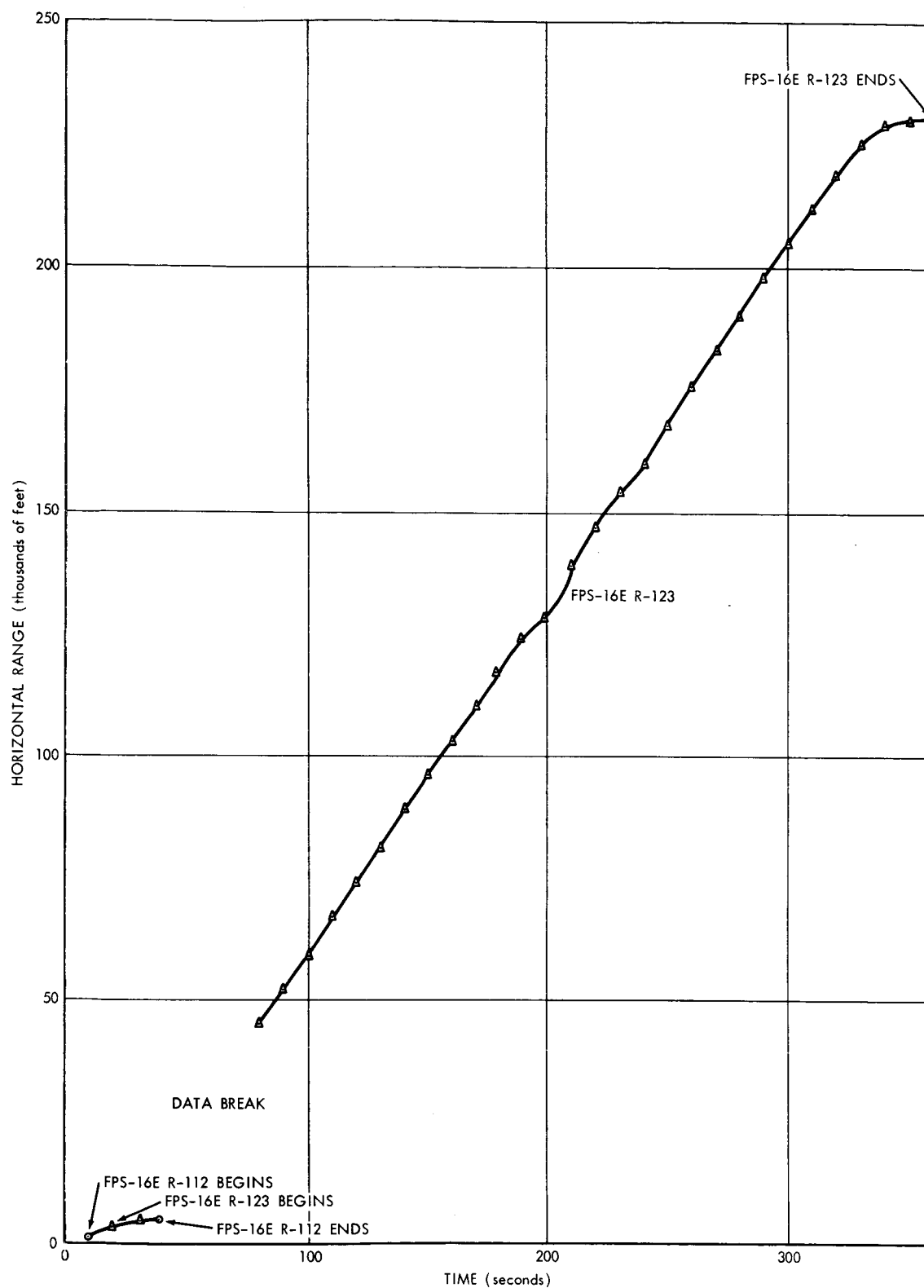


Figure 11. 14.78 UA Radar Plot, Horizontal Range vs Time

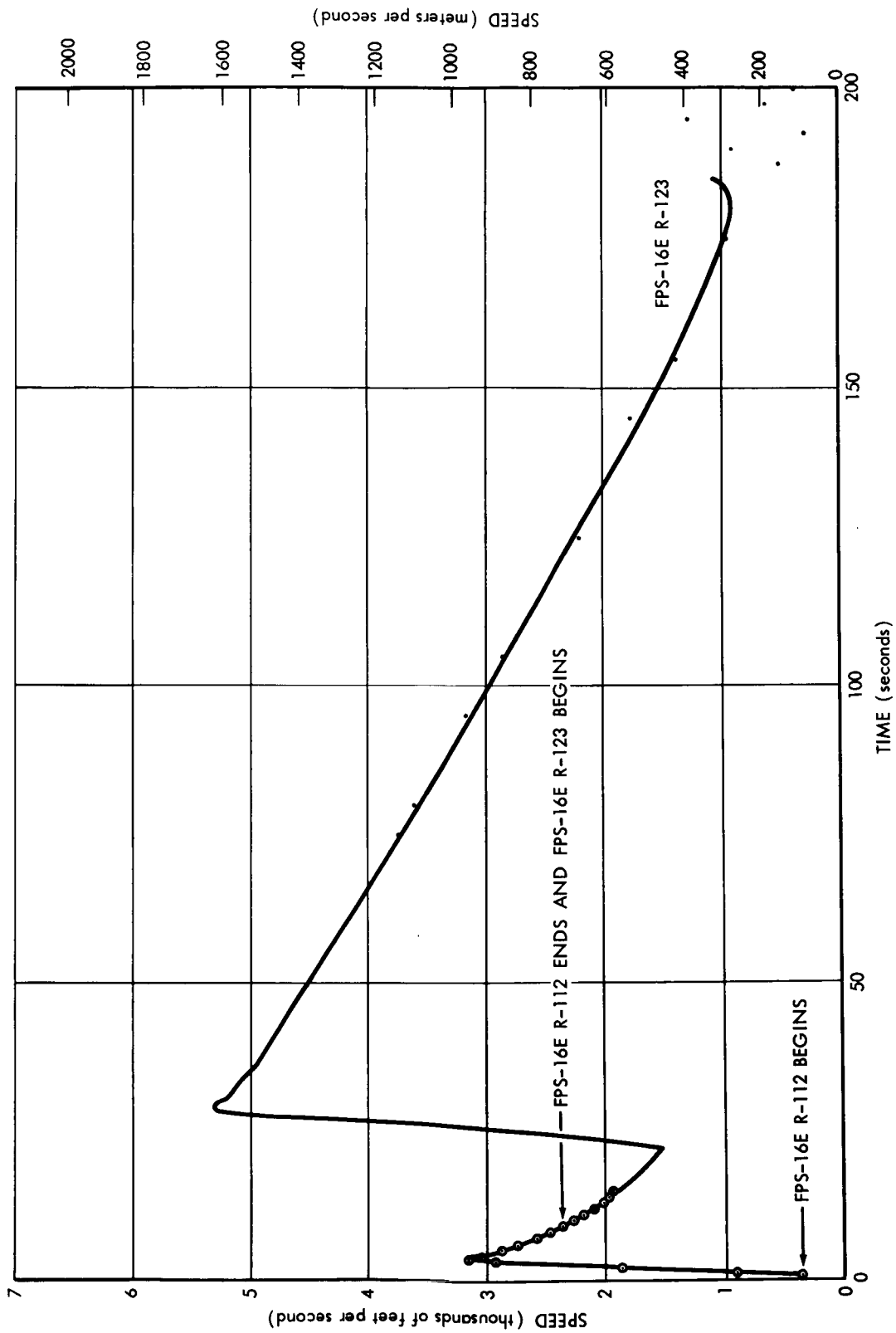


Figure 12. 14.78 UA Radar Plot, Speed vs Time

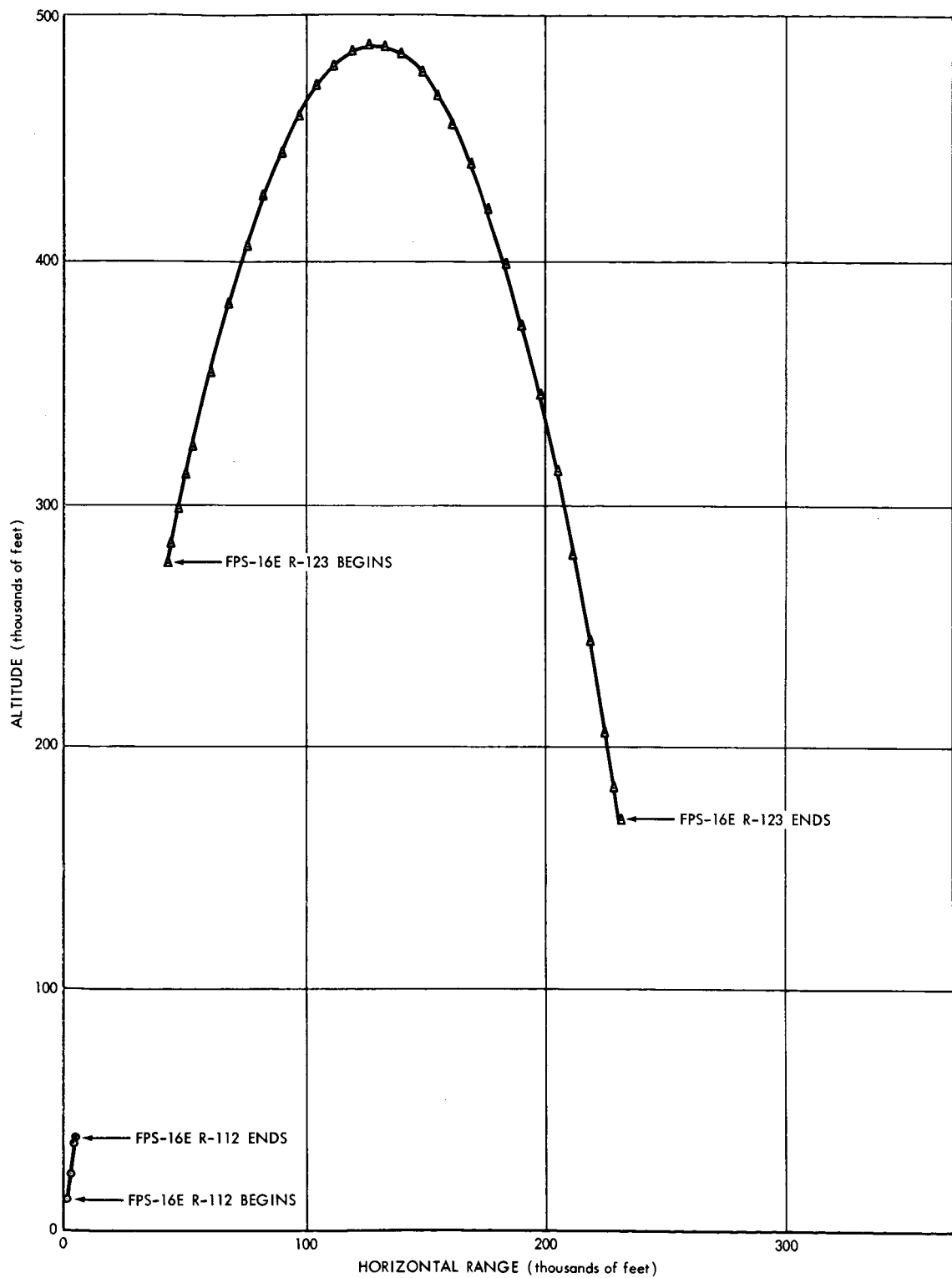


Figure 13. 14.78 UA Radar Plot, Altitude vs Horizontal Range

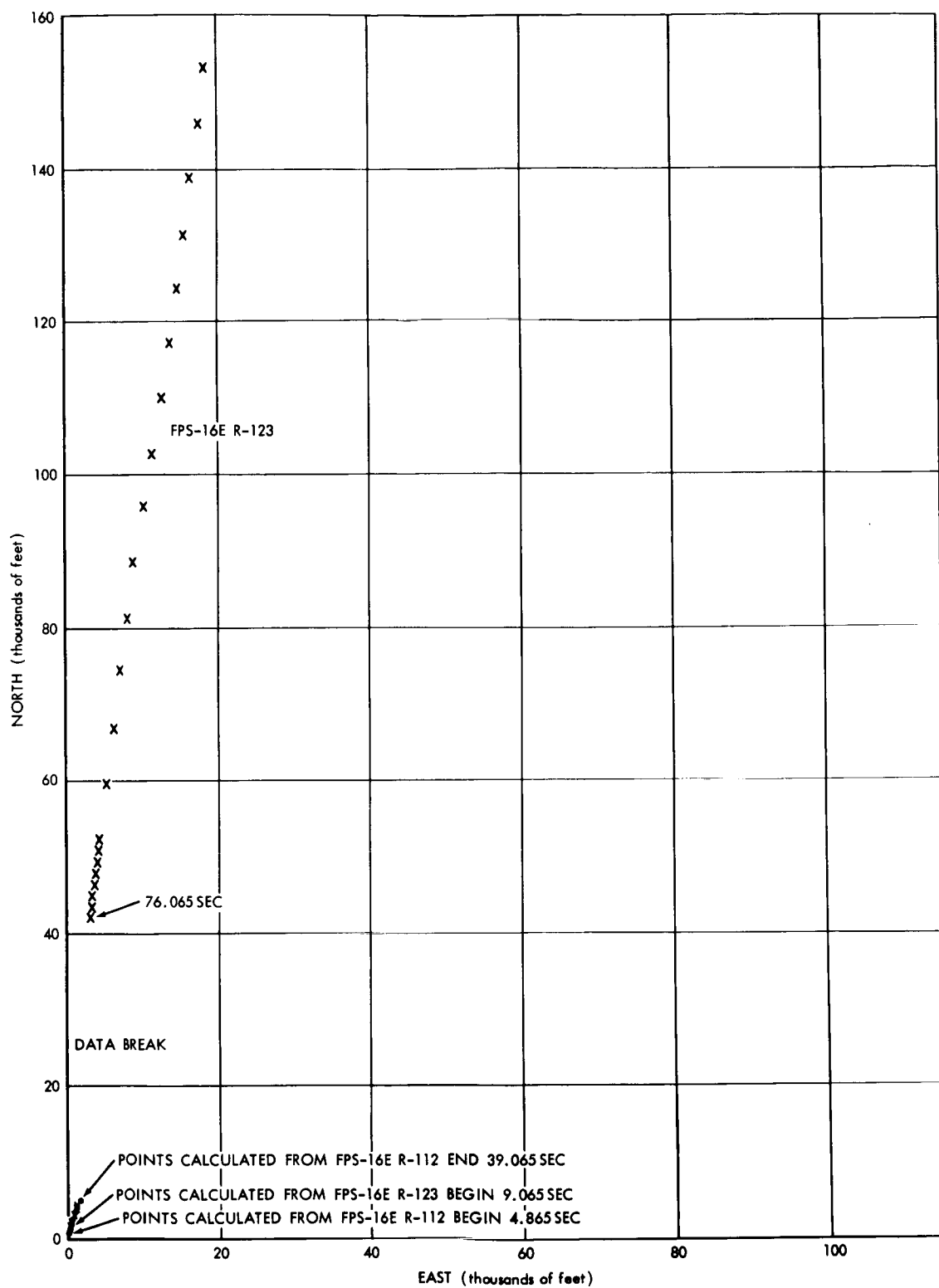


Figure 14. 14.78 UA Radar Plot, North Range vs East Range

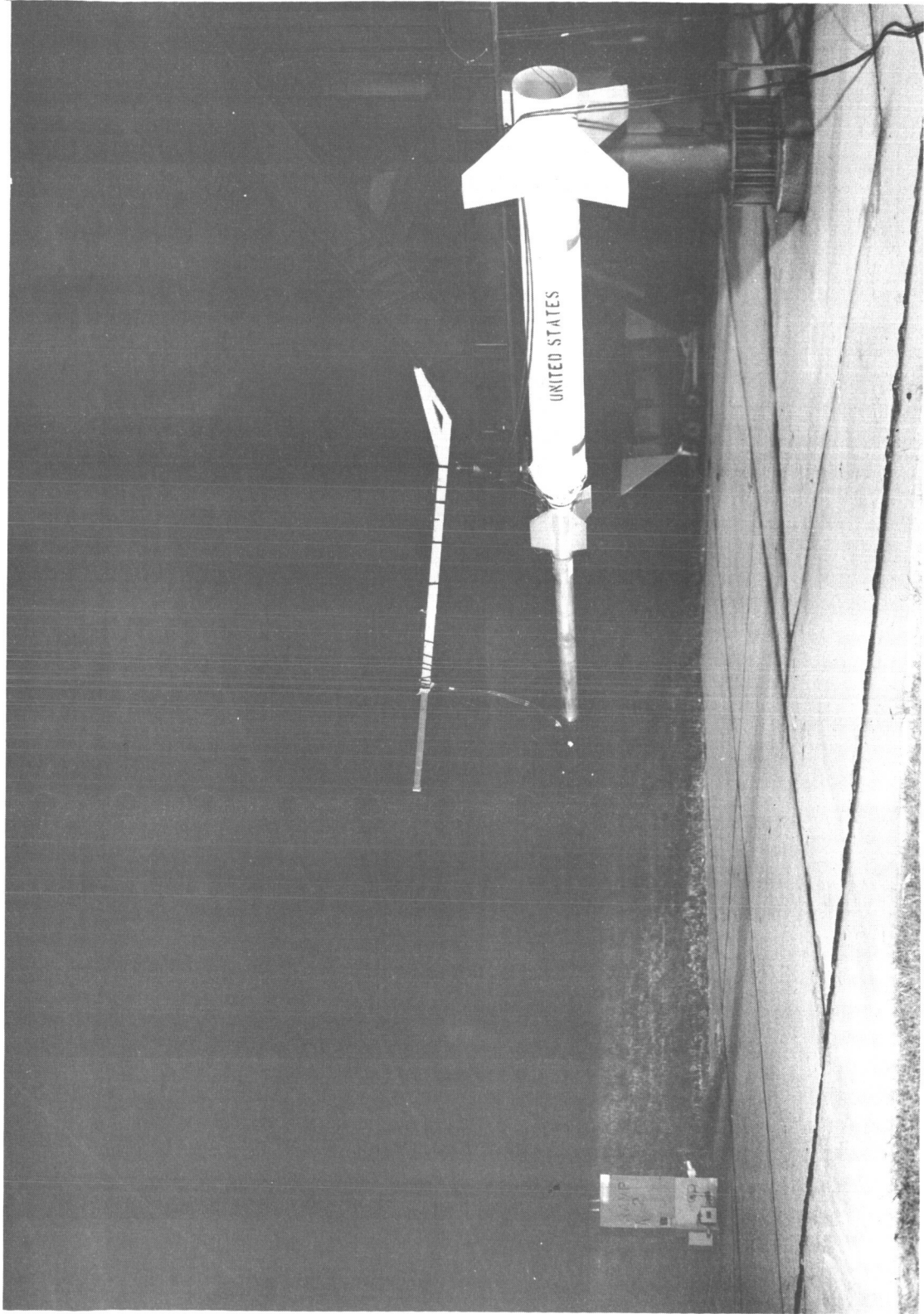


Figure 15. 14.133 NA Photograph

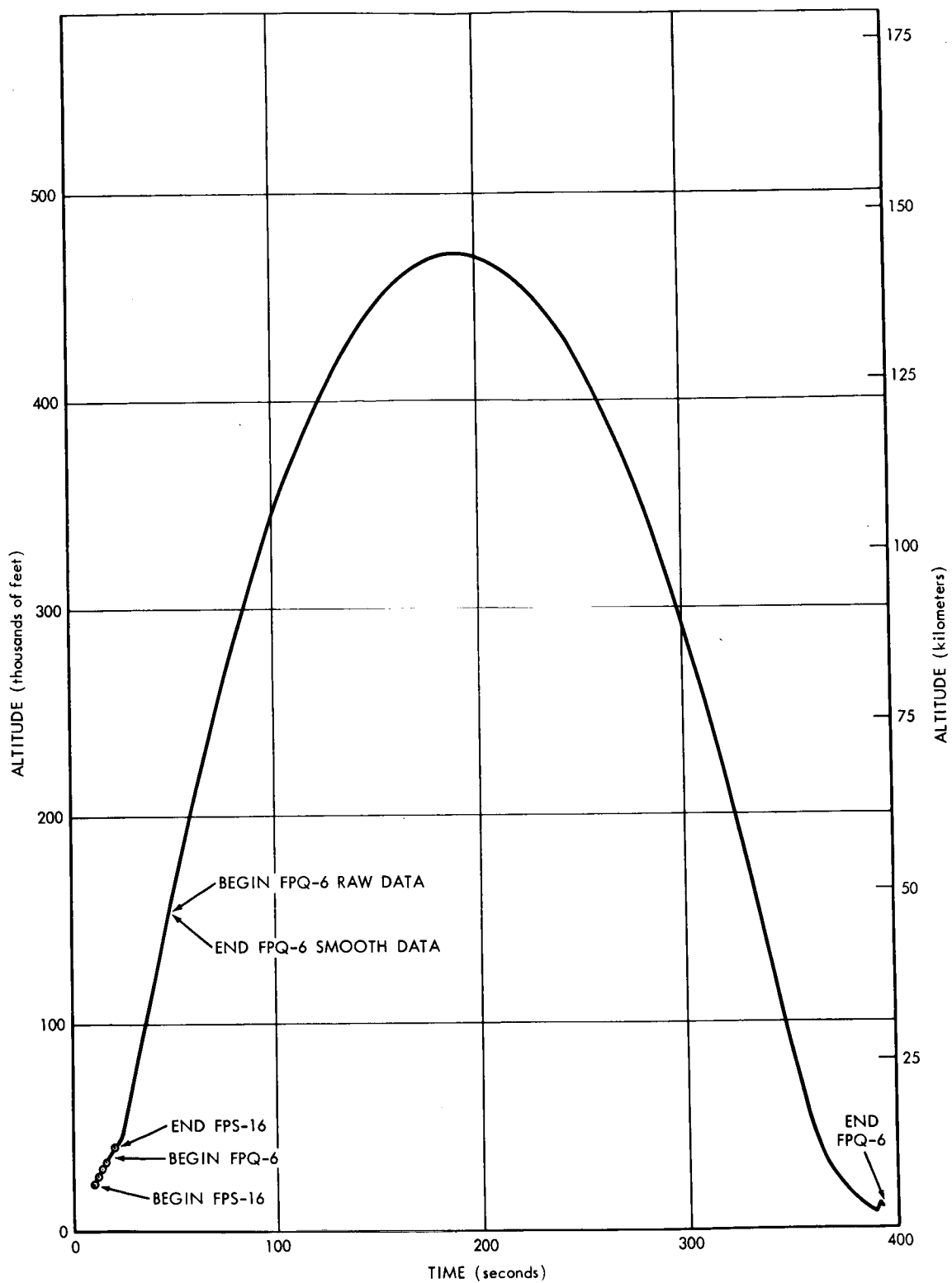


Figure 16. 14.133 NA Radar Plot, Altitude vs Time

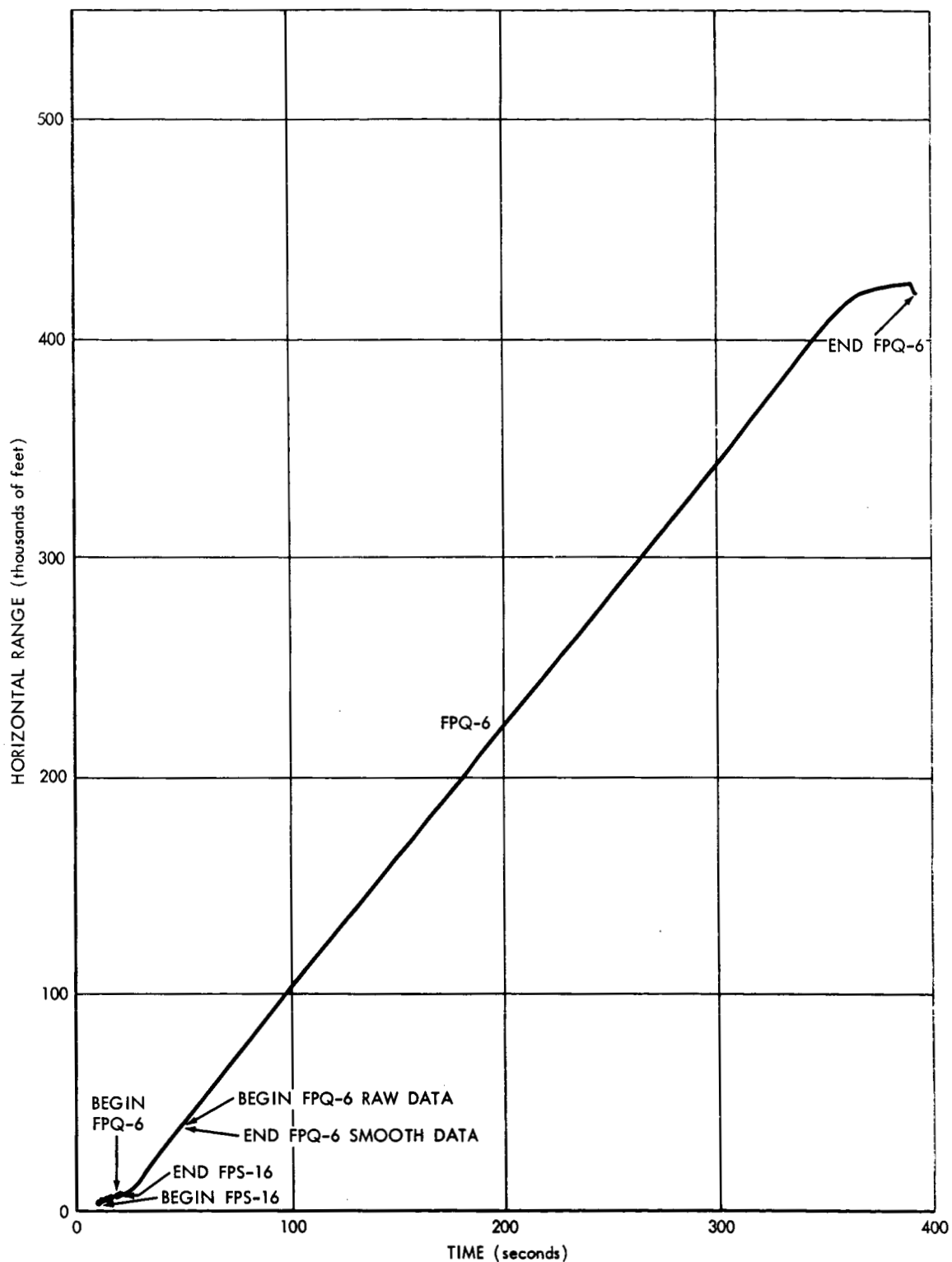


Figure 17. 14.133NA Radar Plot, Horizontal Range vs Time

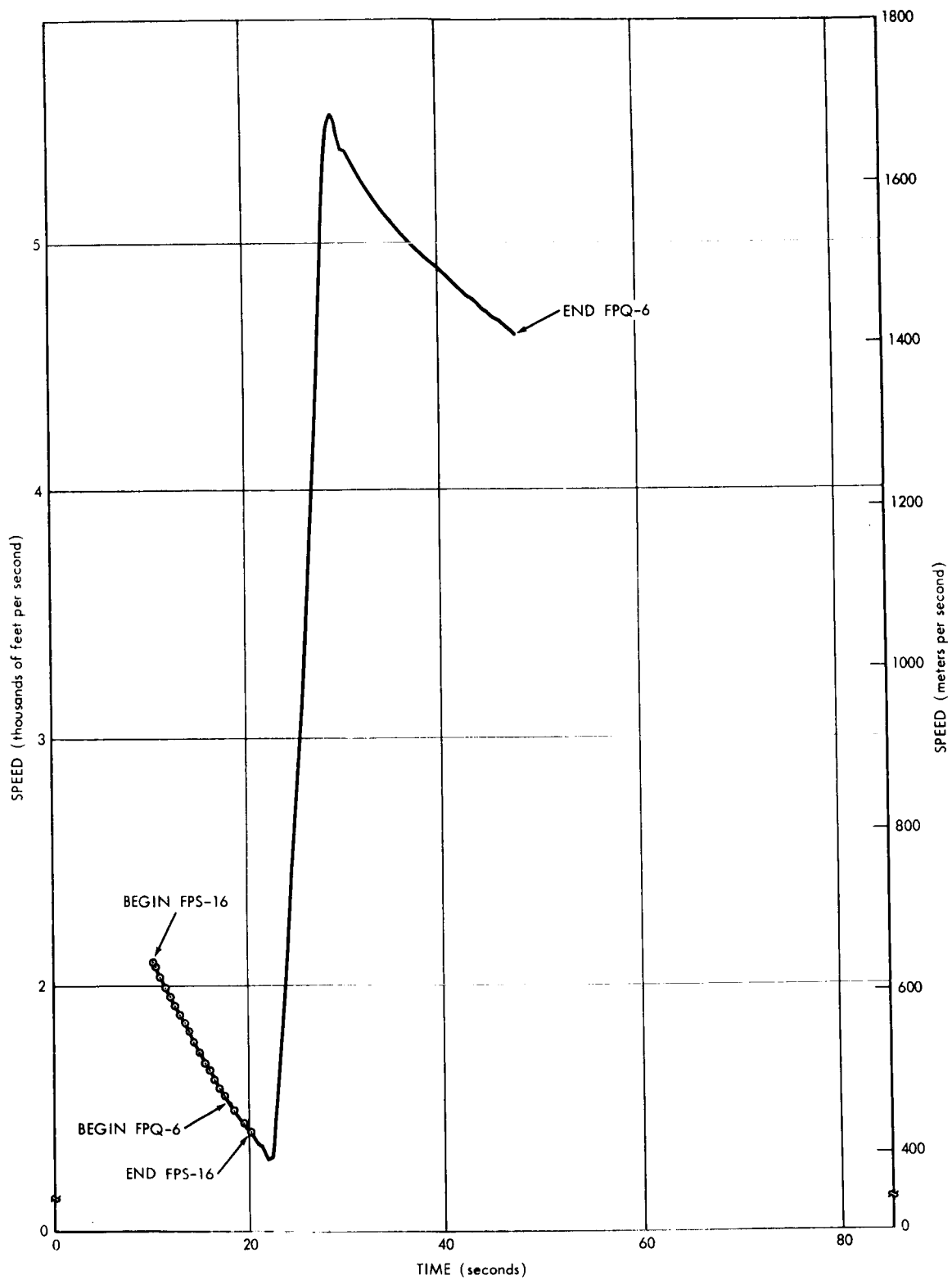


Figure 18. 14.133 NA Radar Plot, Speed vs Time

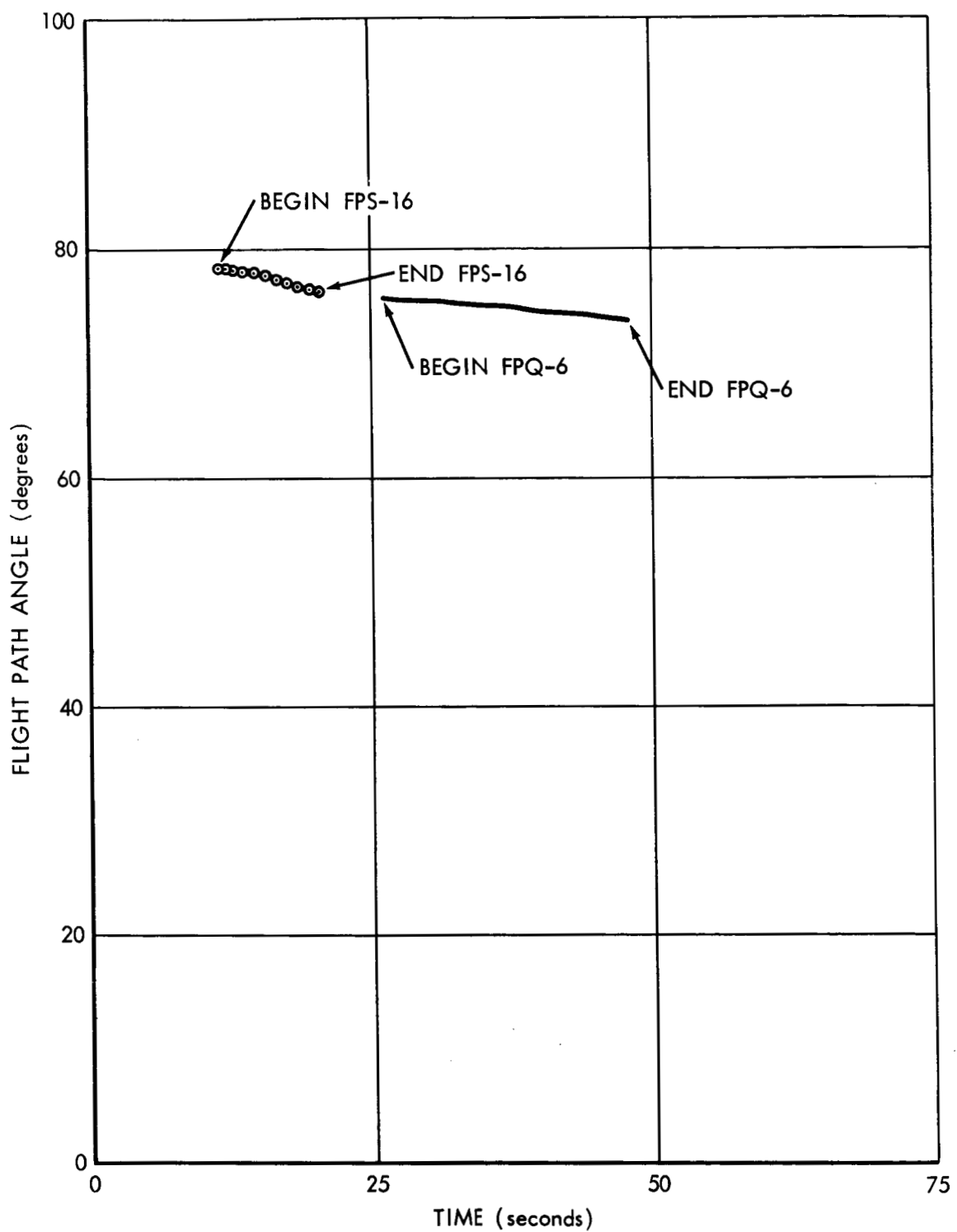


Figure 19. 14.133 NA Radar Plot, Flight Path Angle vs Time

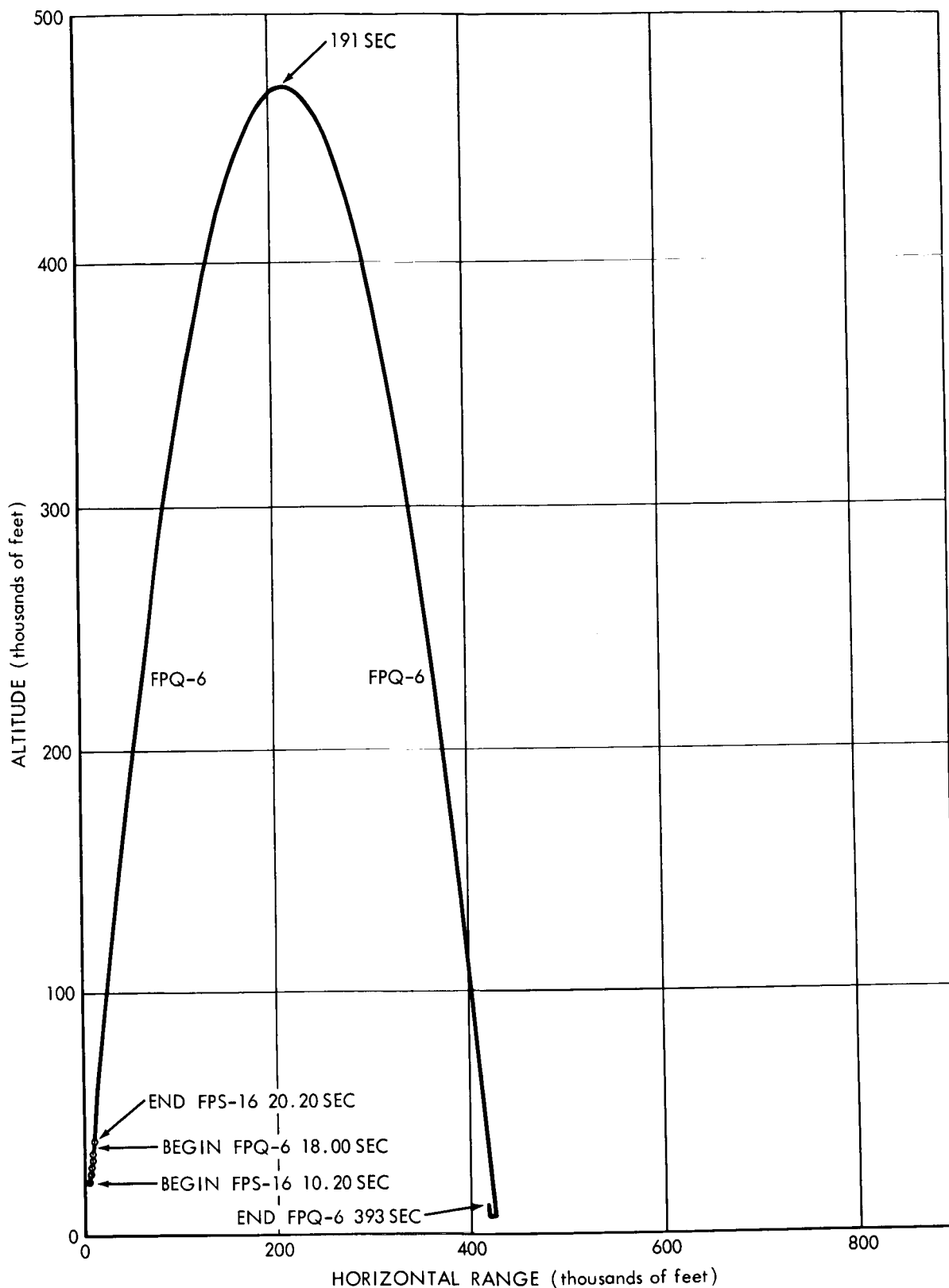


Figure 20. 14.133NA Radar Plot, Altitude vs Horizontal Range

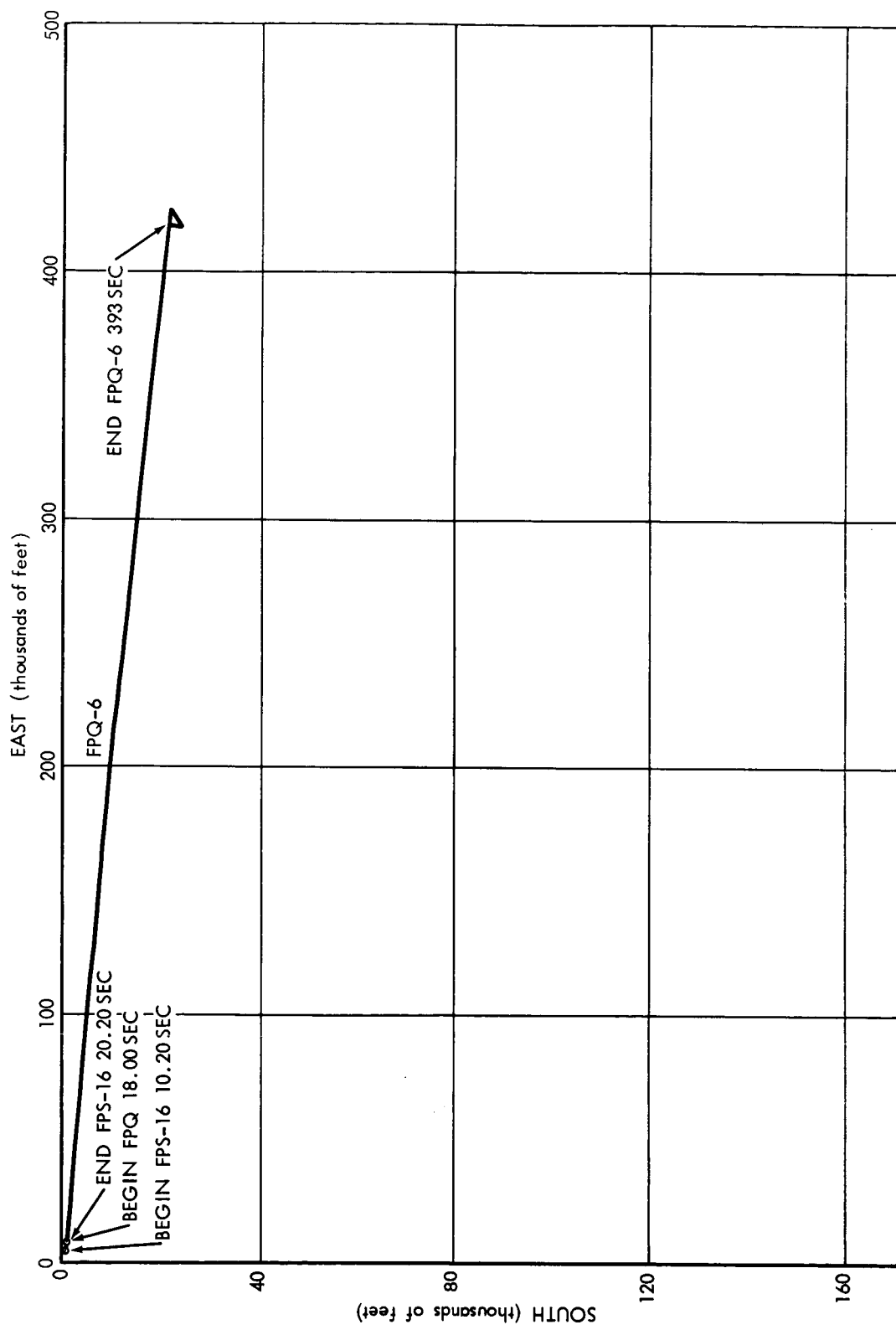


Figure 21. 14.133 NA Radar Plot, South Range vs East Range

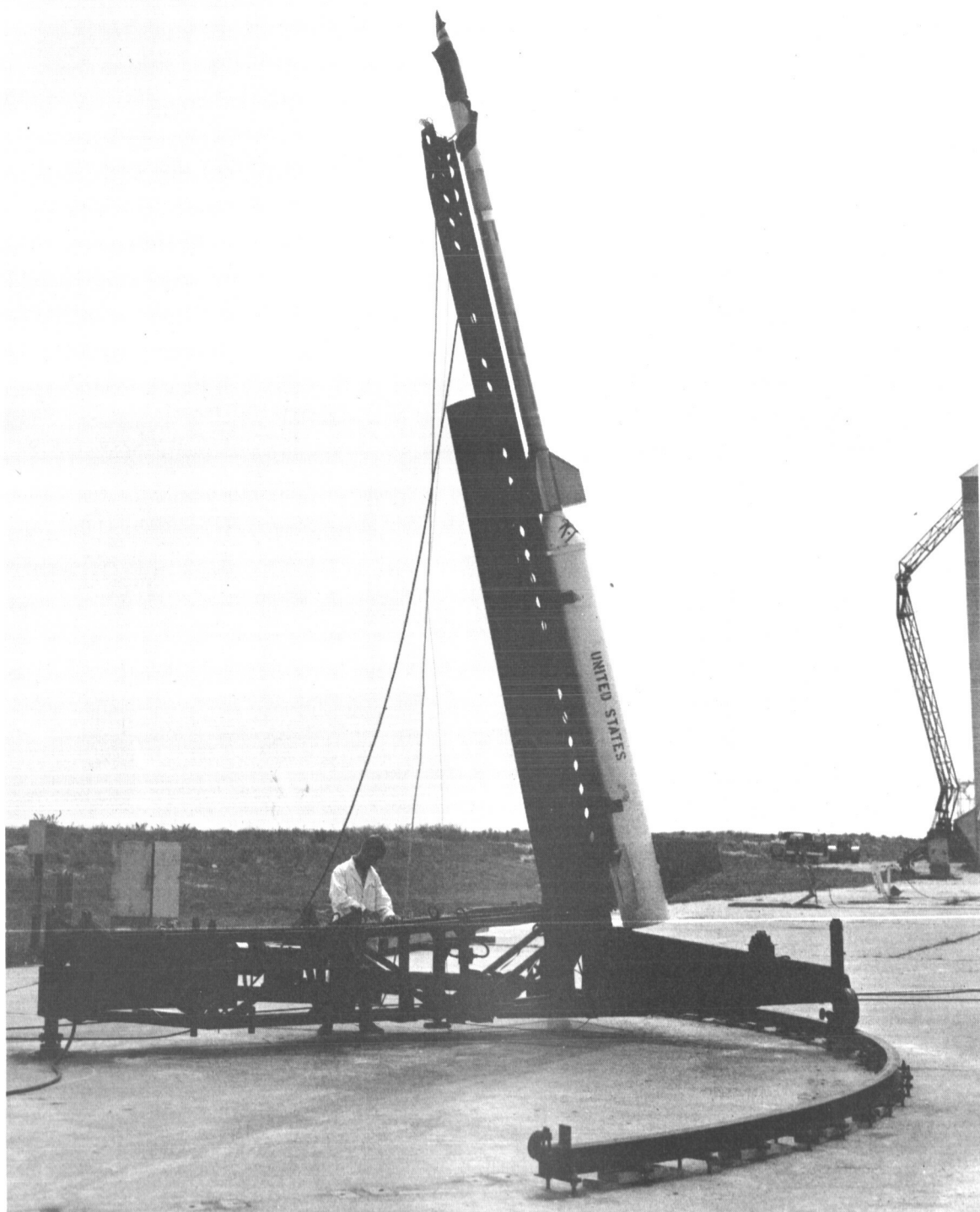


Figure 22. 14.210 GI Photograph

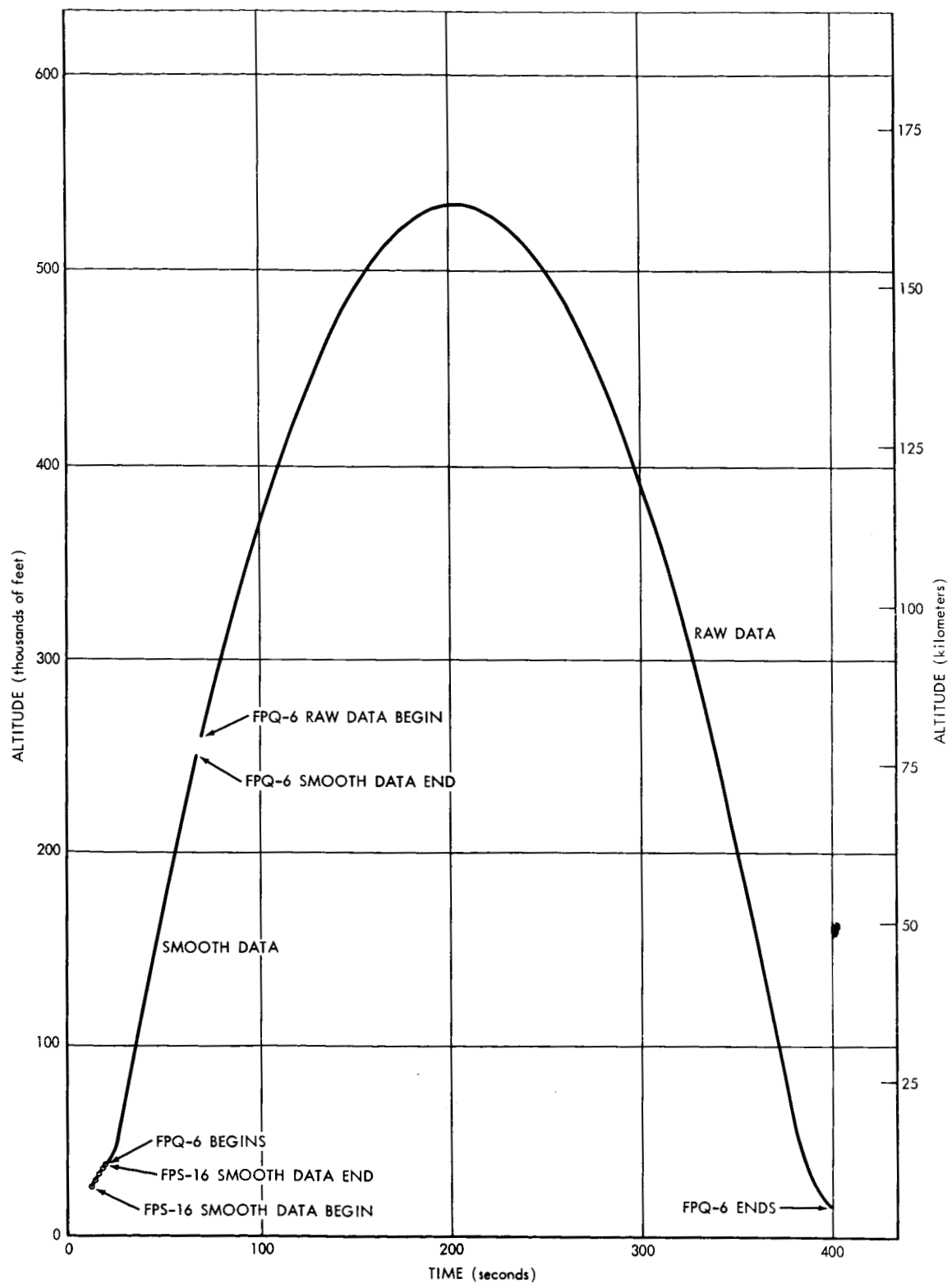


Figure 23. 14.210GI Radar Plot, Altitude vs Time

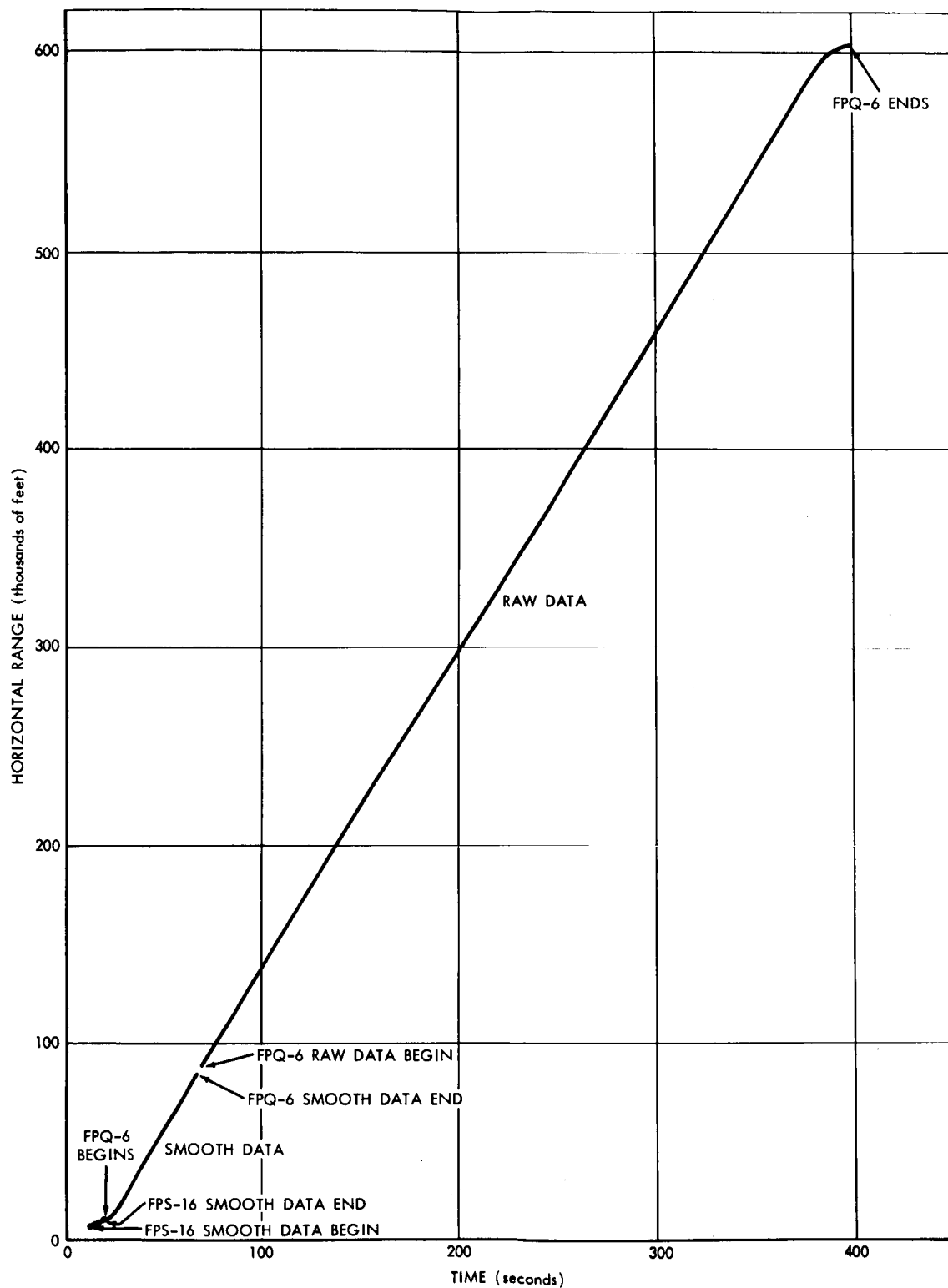


Figure 24. 14.210 GI Radar Plot, Horizontal Range vs Time

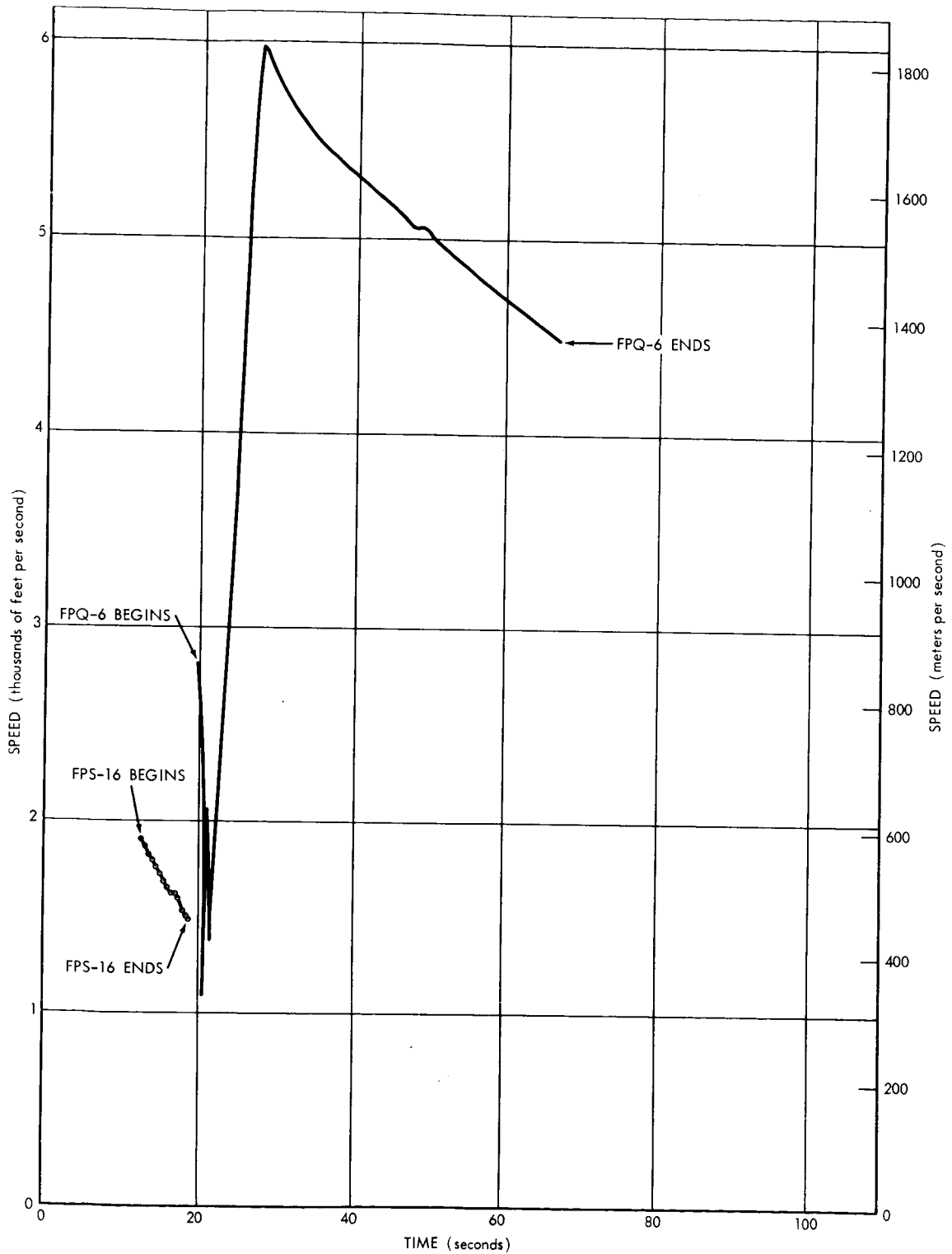


Figure 25. 14.210GI Radar Plot, Speed vs Time

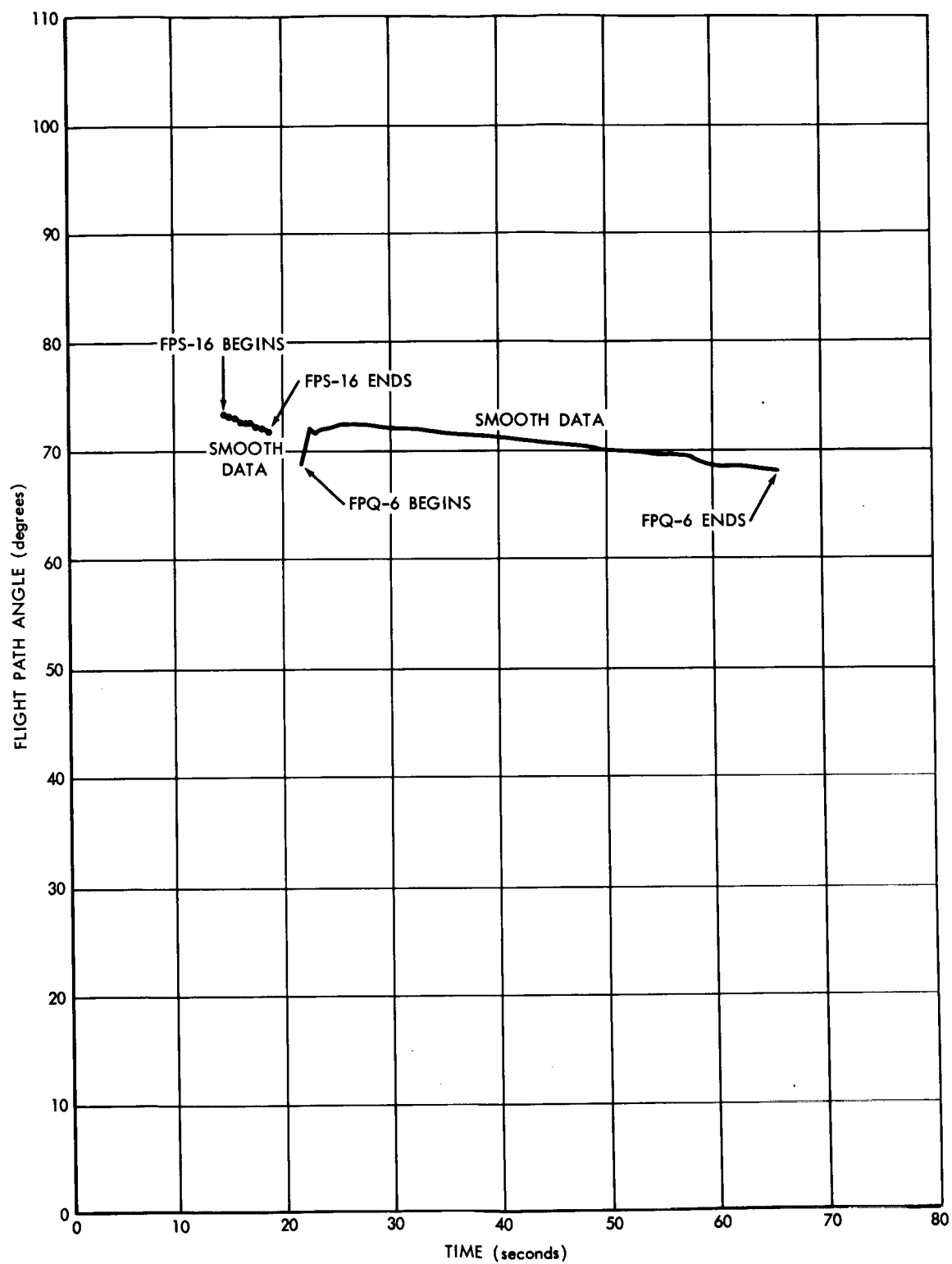


Figure 26. 14.210 GI Radar Plot, Flight Path Angle vs Time

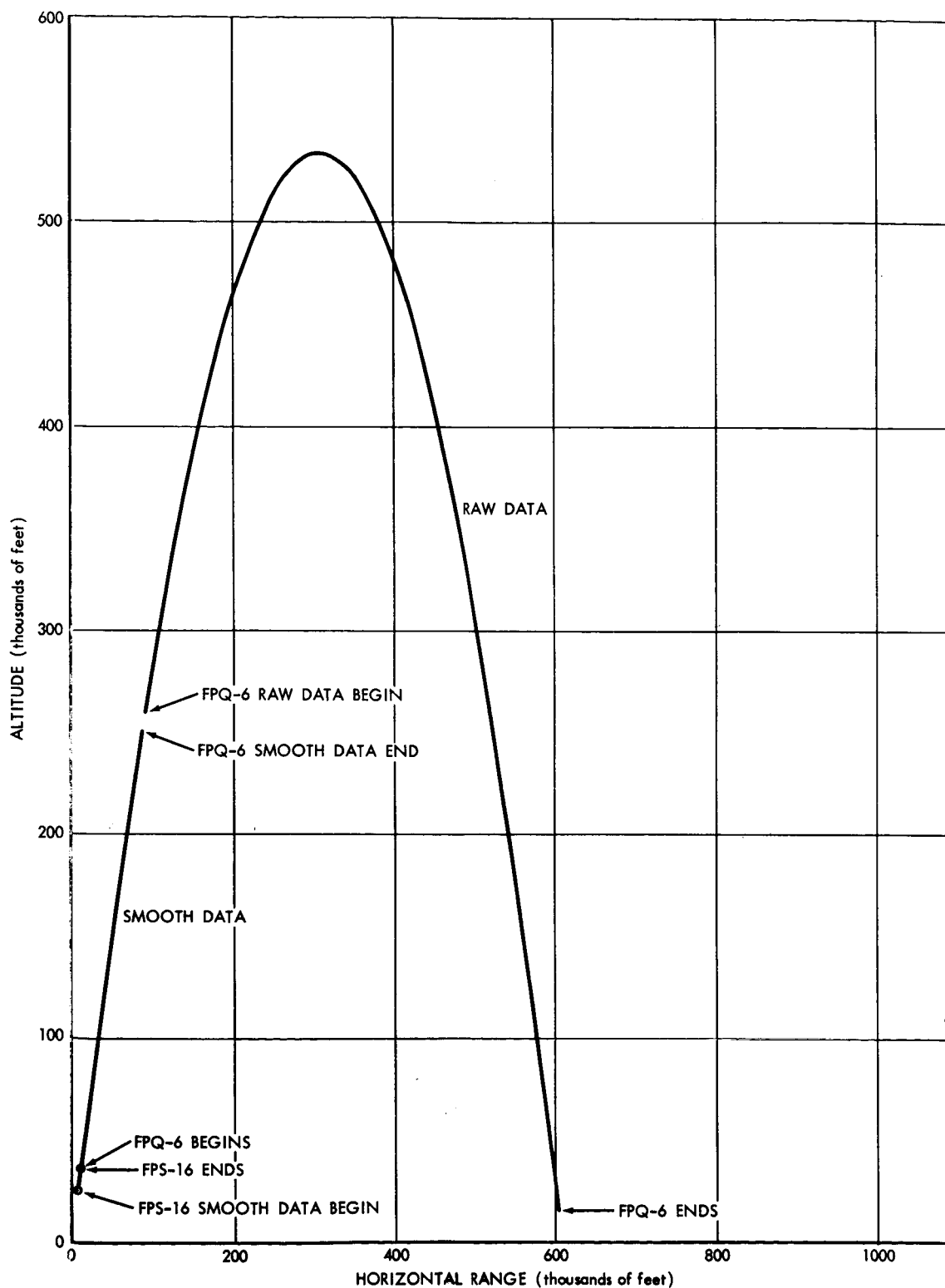


Figure 27. 14.210 GI Radar Plot, Altitude vs Horizontal Range

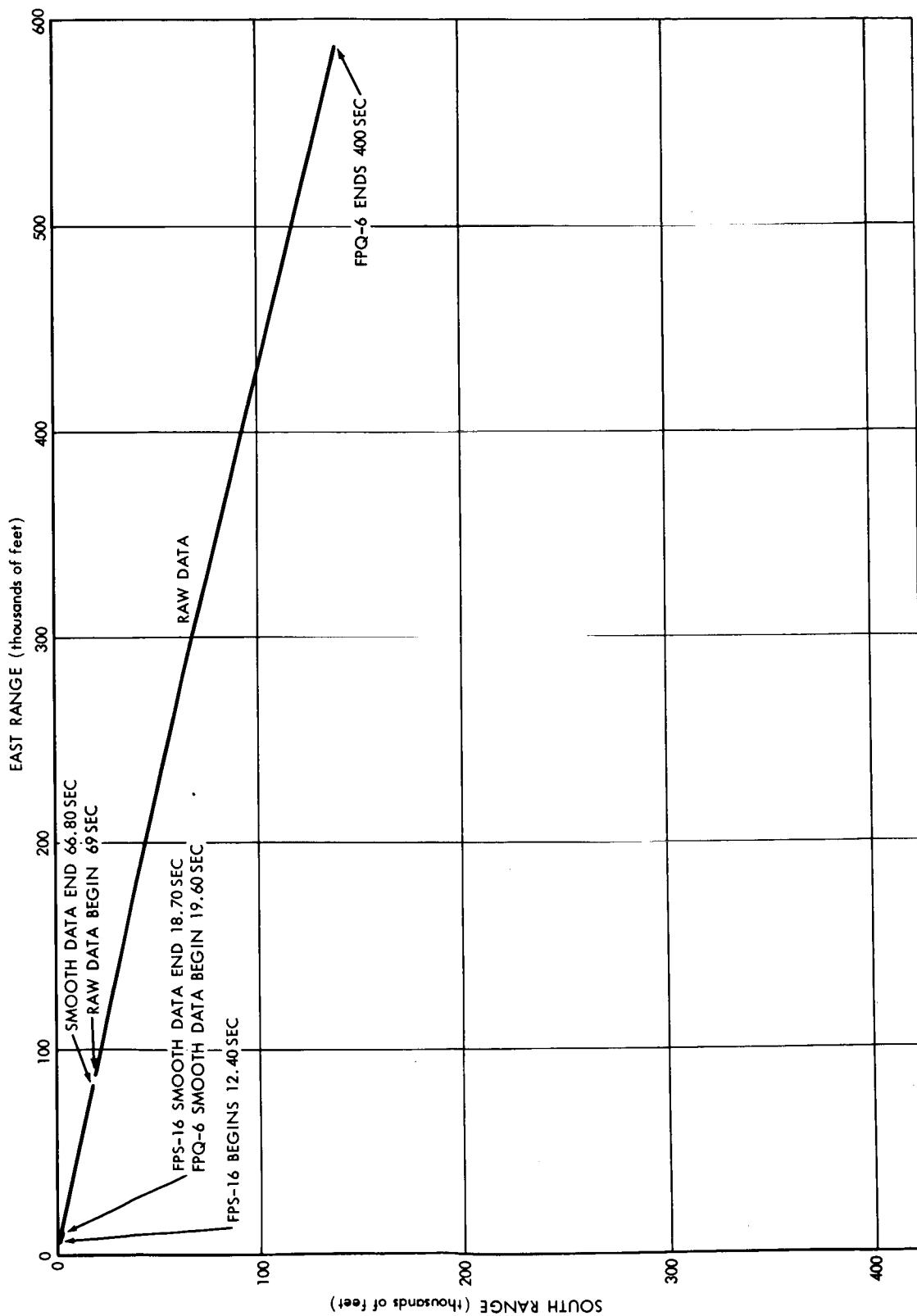


Figure 28. 14.210GI Radar Plot, South Range vs East Range

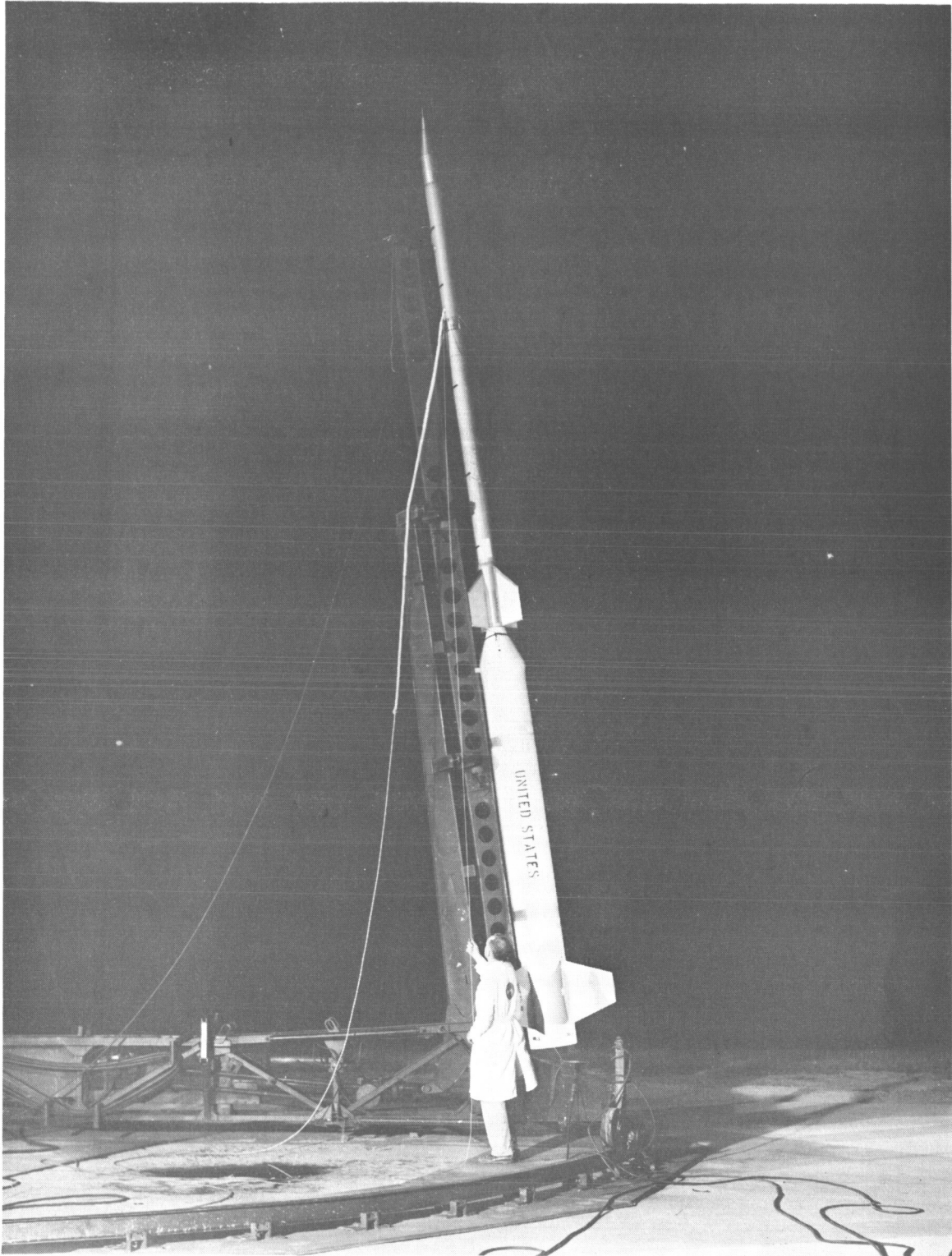


Figure 29. 14.213 UI Photograph

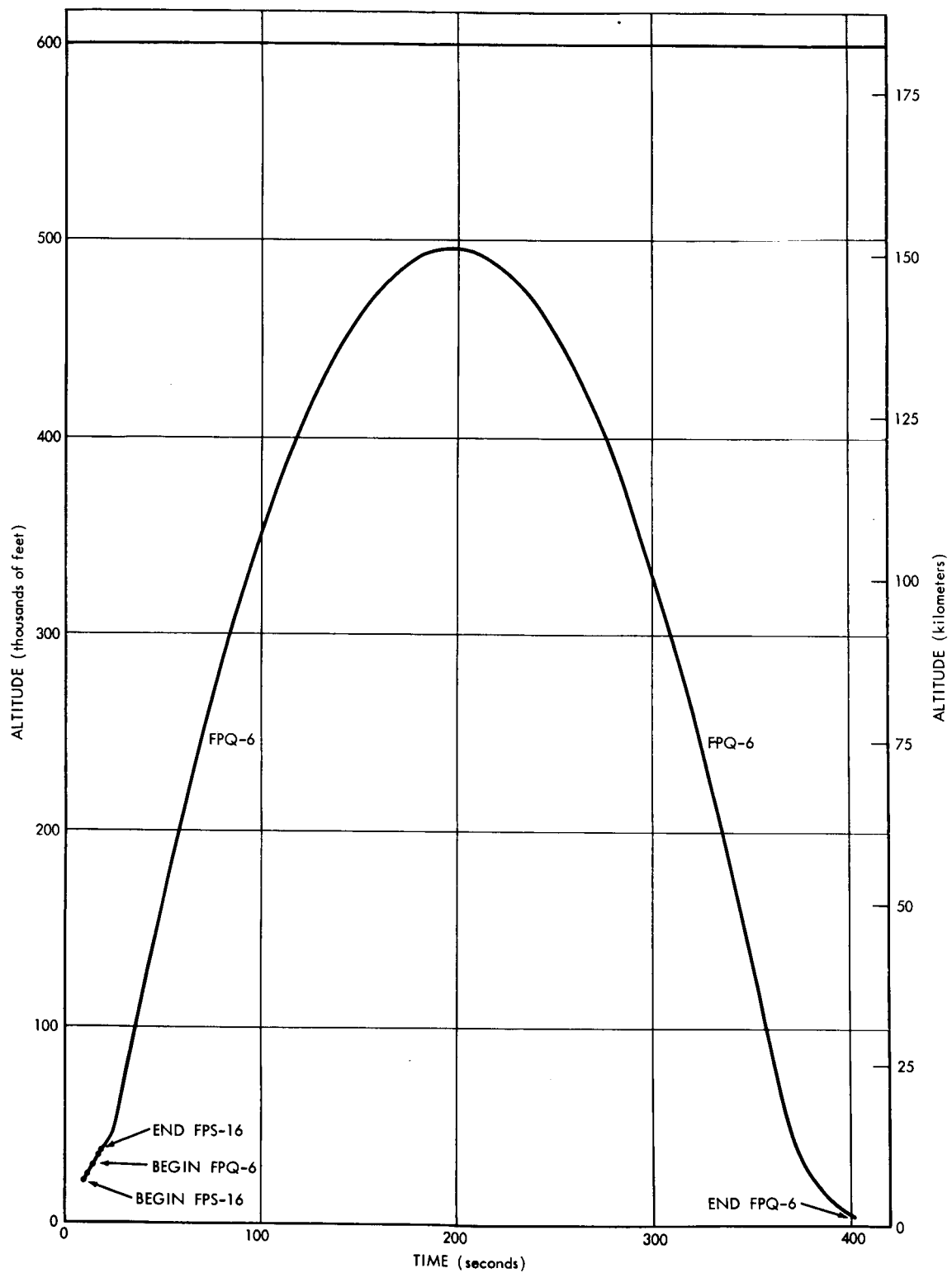


Figure 30. 14.213UI Radar Plot, Altitude vs Time

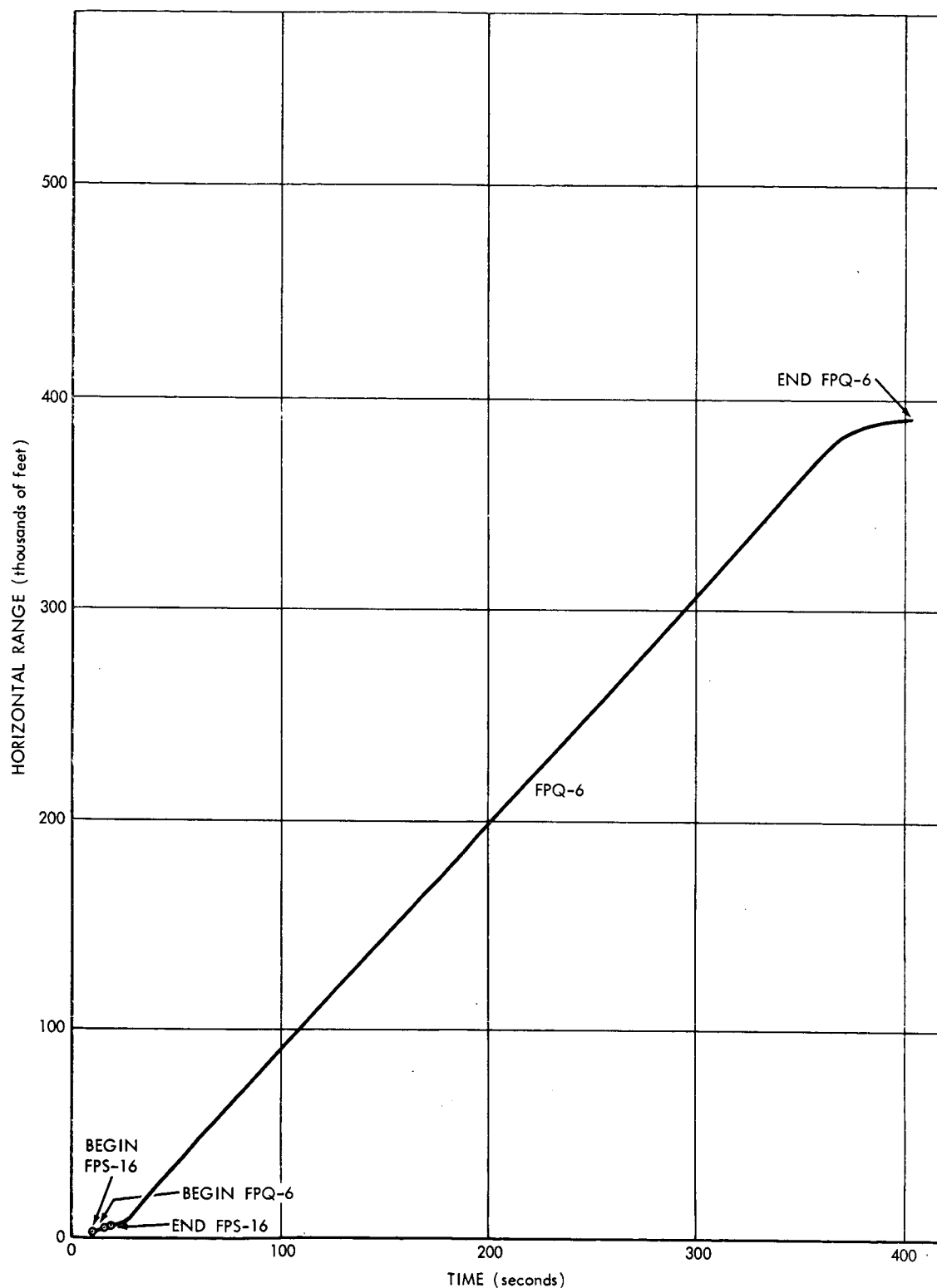


Figure 31. 14.213UI Radar Plot, Horizontal Range vs Time

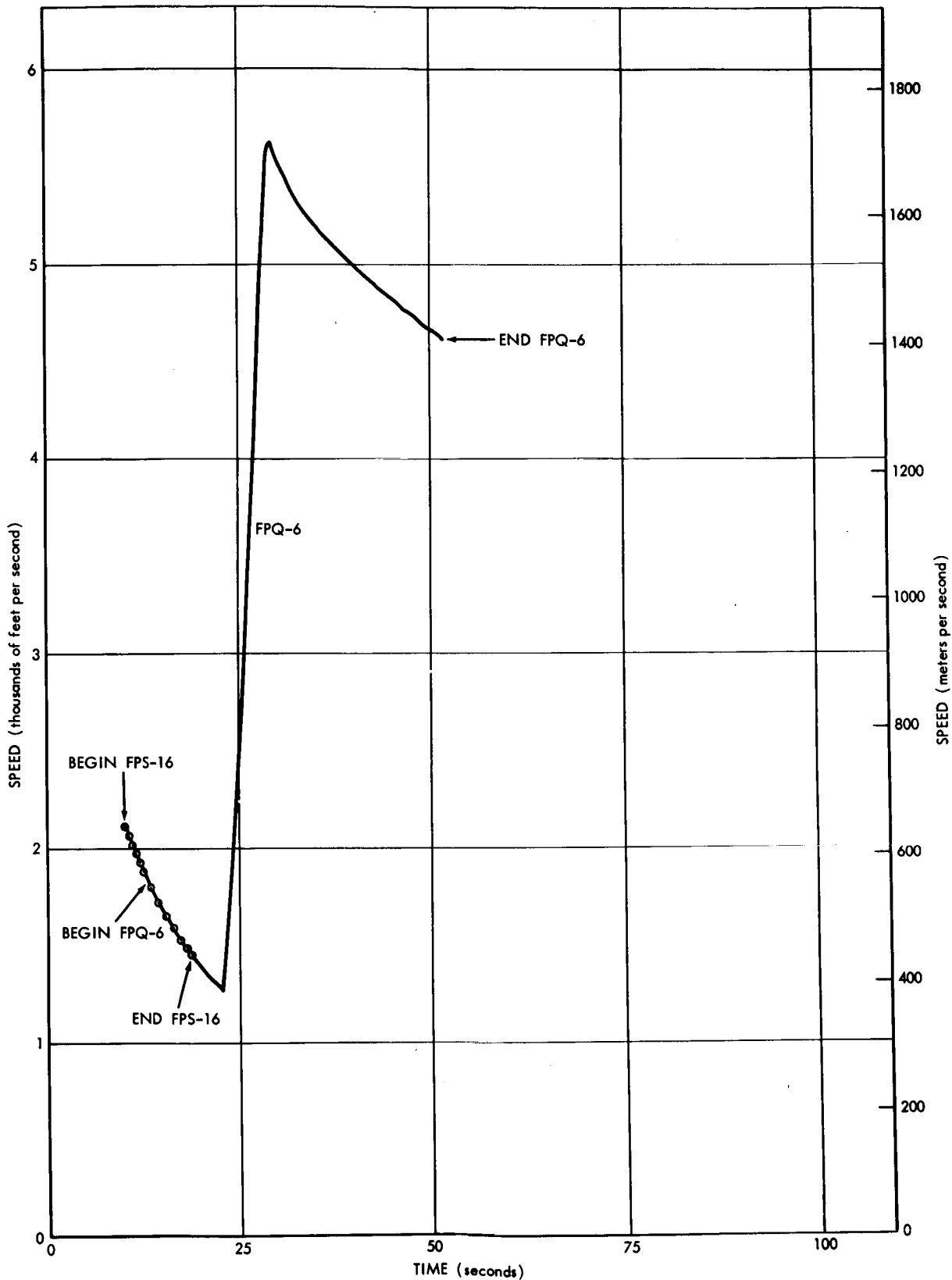


Figure 32. 14.213 UI Radar Plot, Speed vs Time

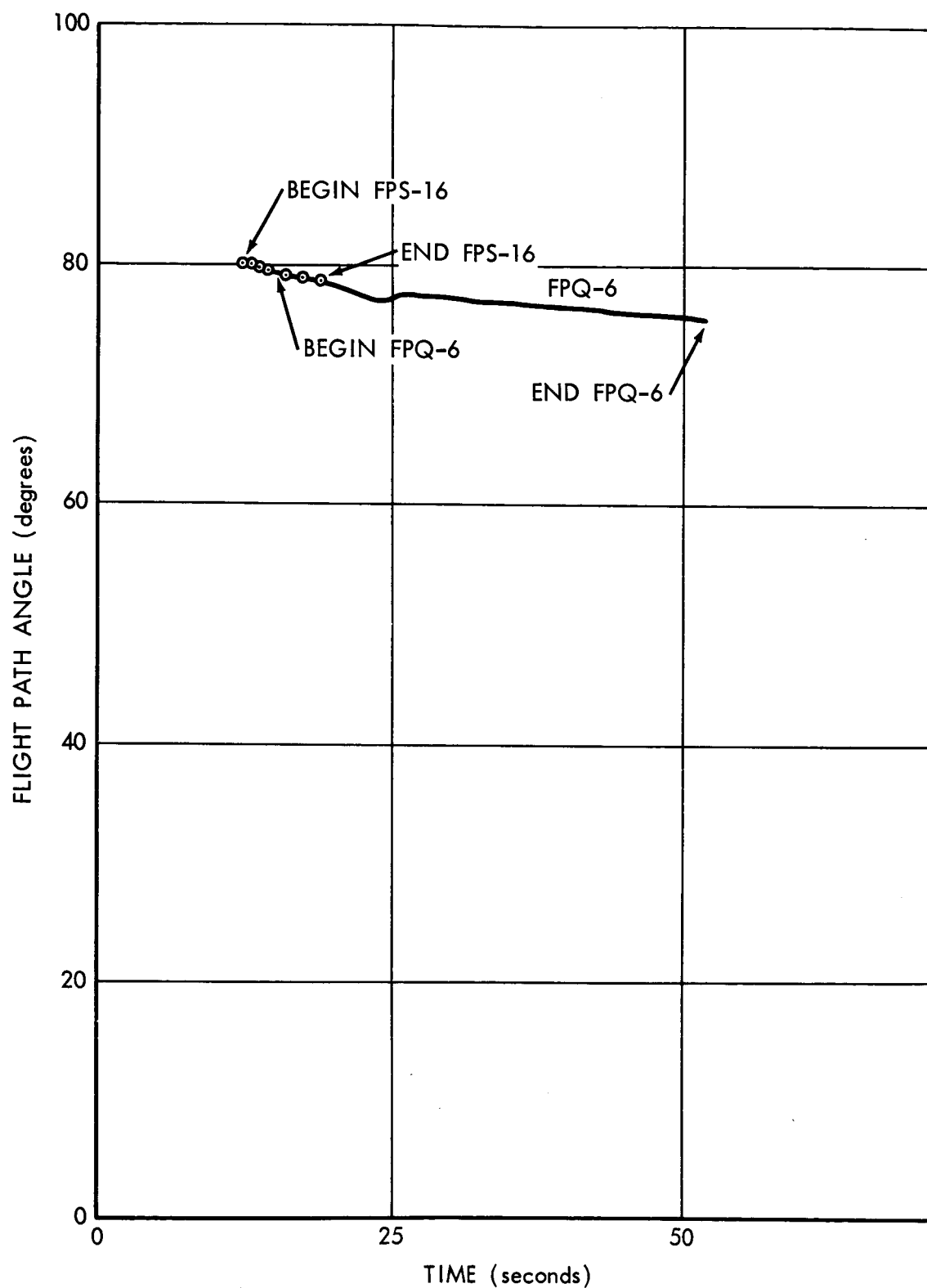


Figure 33. 14.213UI Radar Plot, Flight Path Angle vs Time

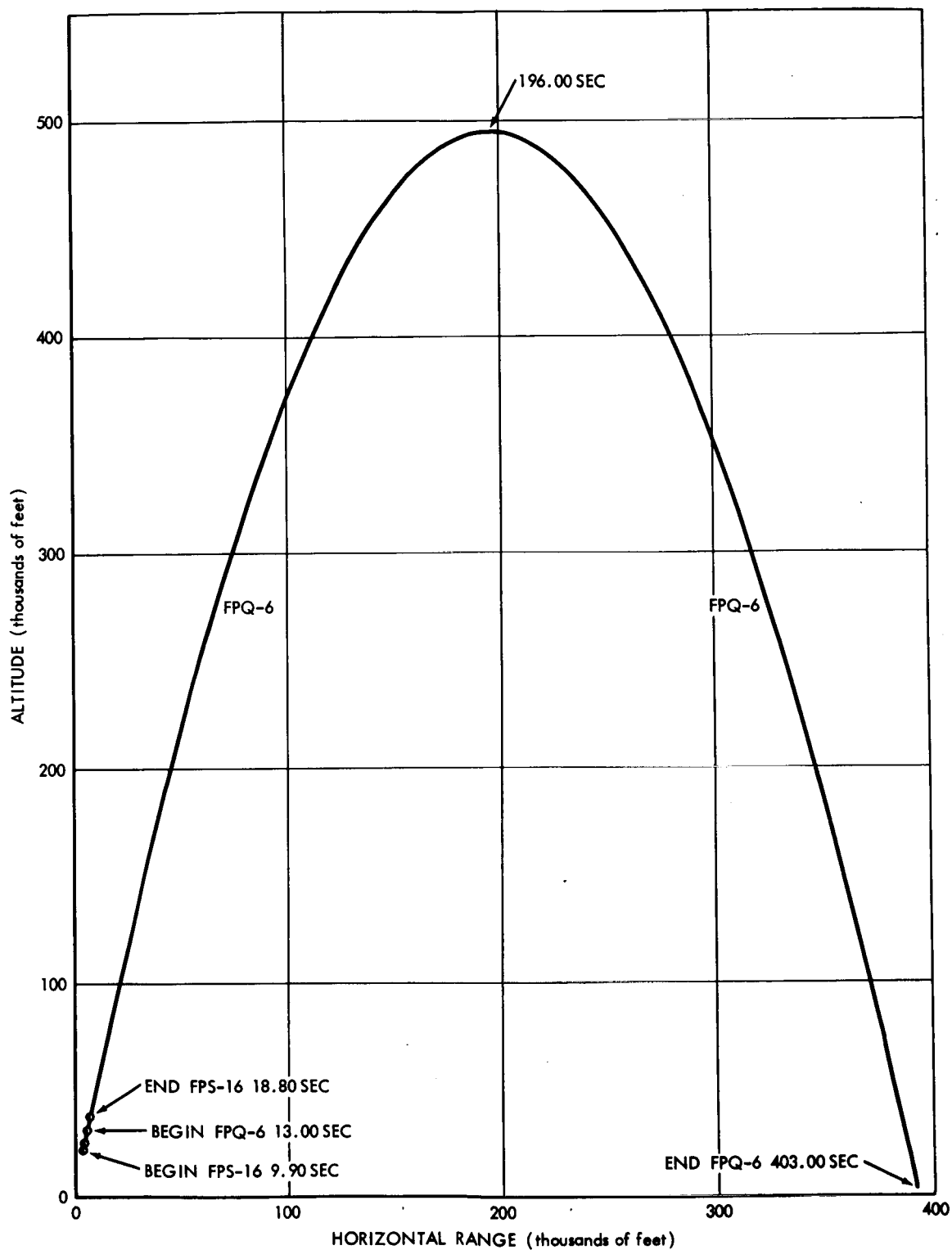


Figure 34. 14.213 UI Radar Plot, Altitude vs Horizontal Range

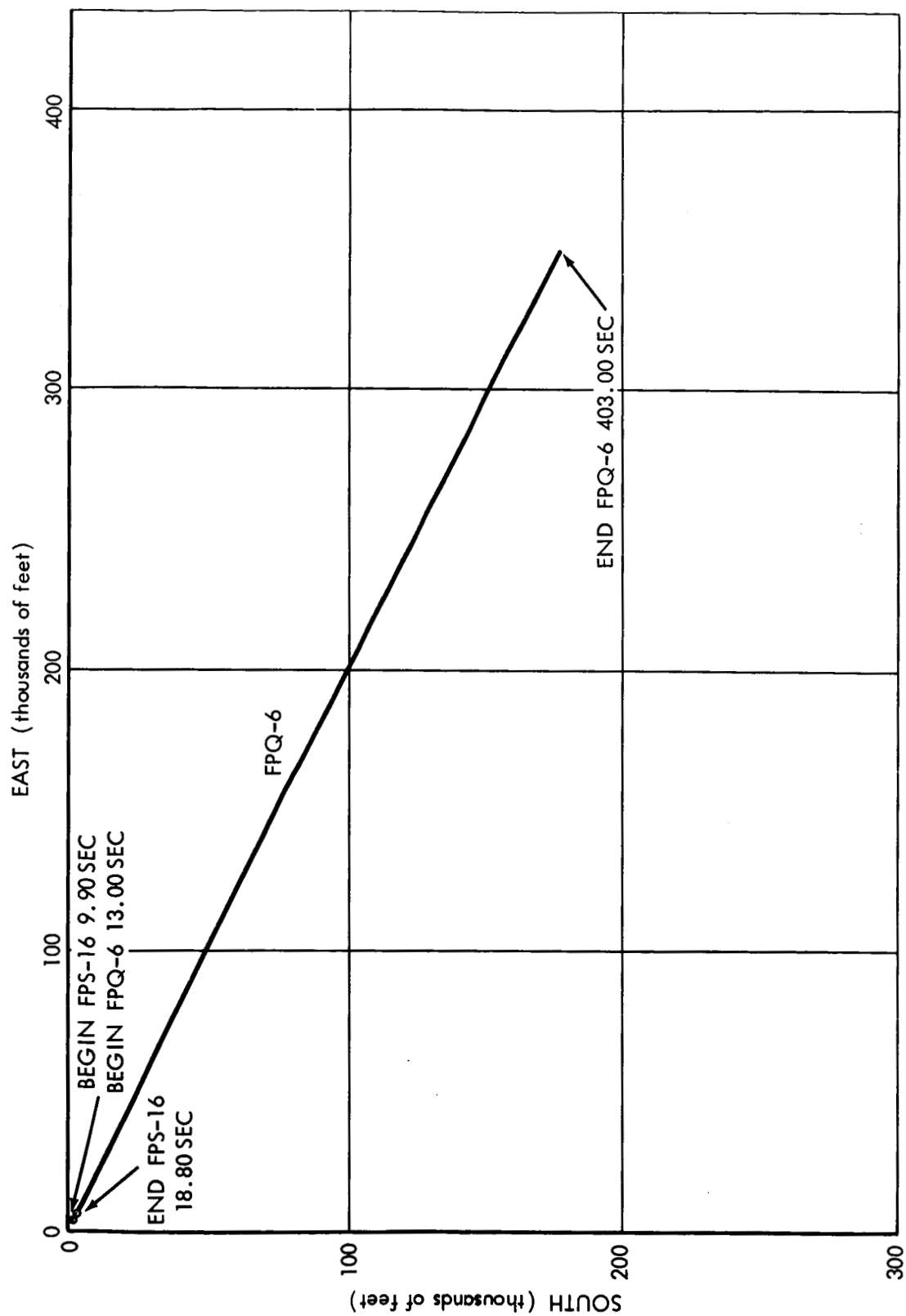


Figure 35. 14.213 UI Radar Plot, South Range vs East Range

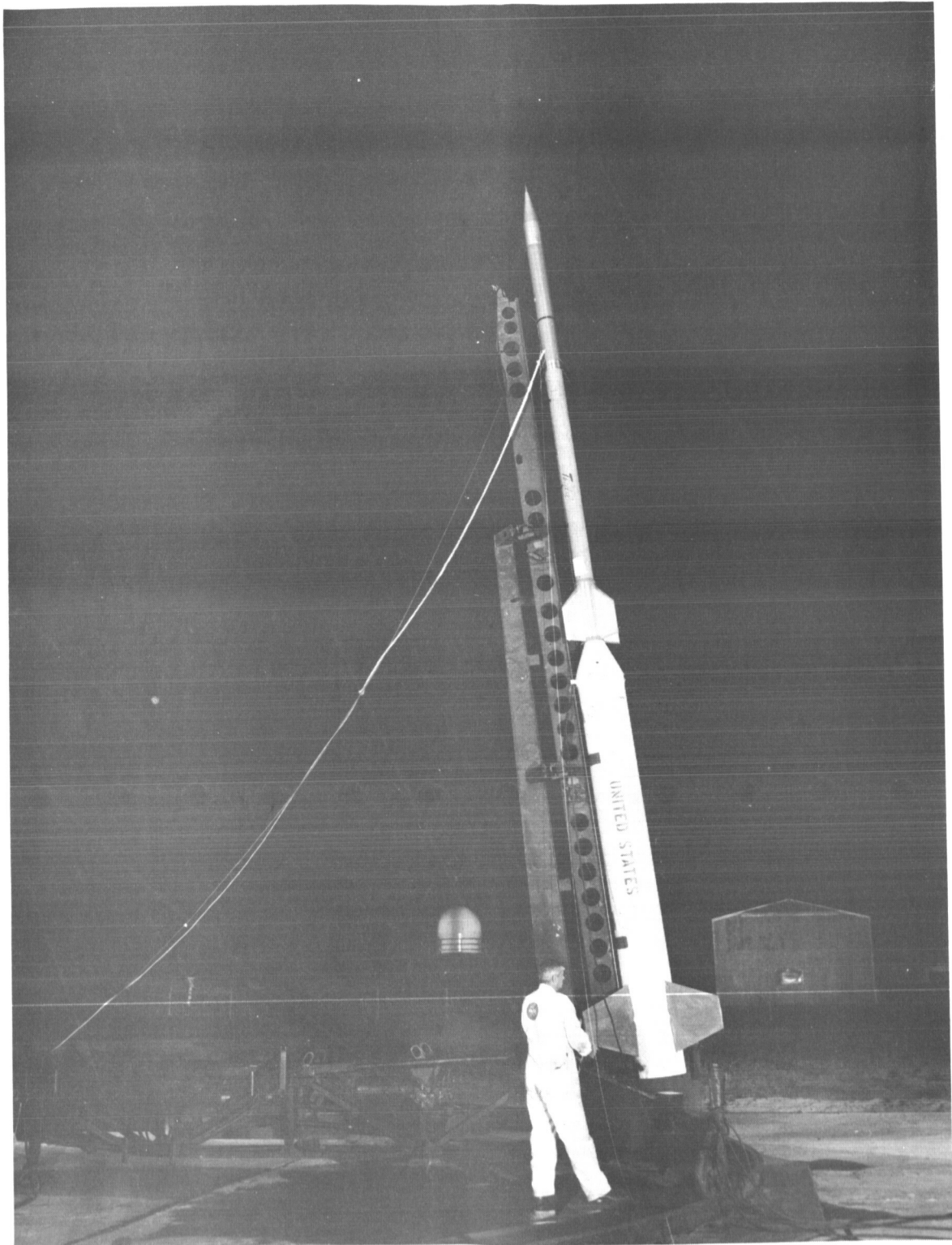


Figure 36. 14.214 UI Photograph

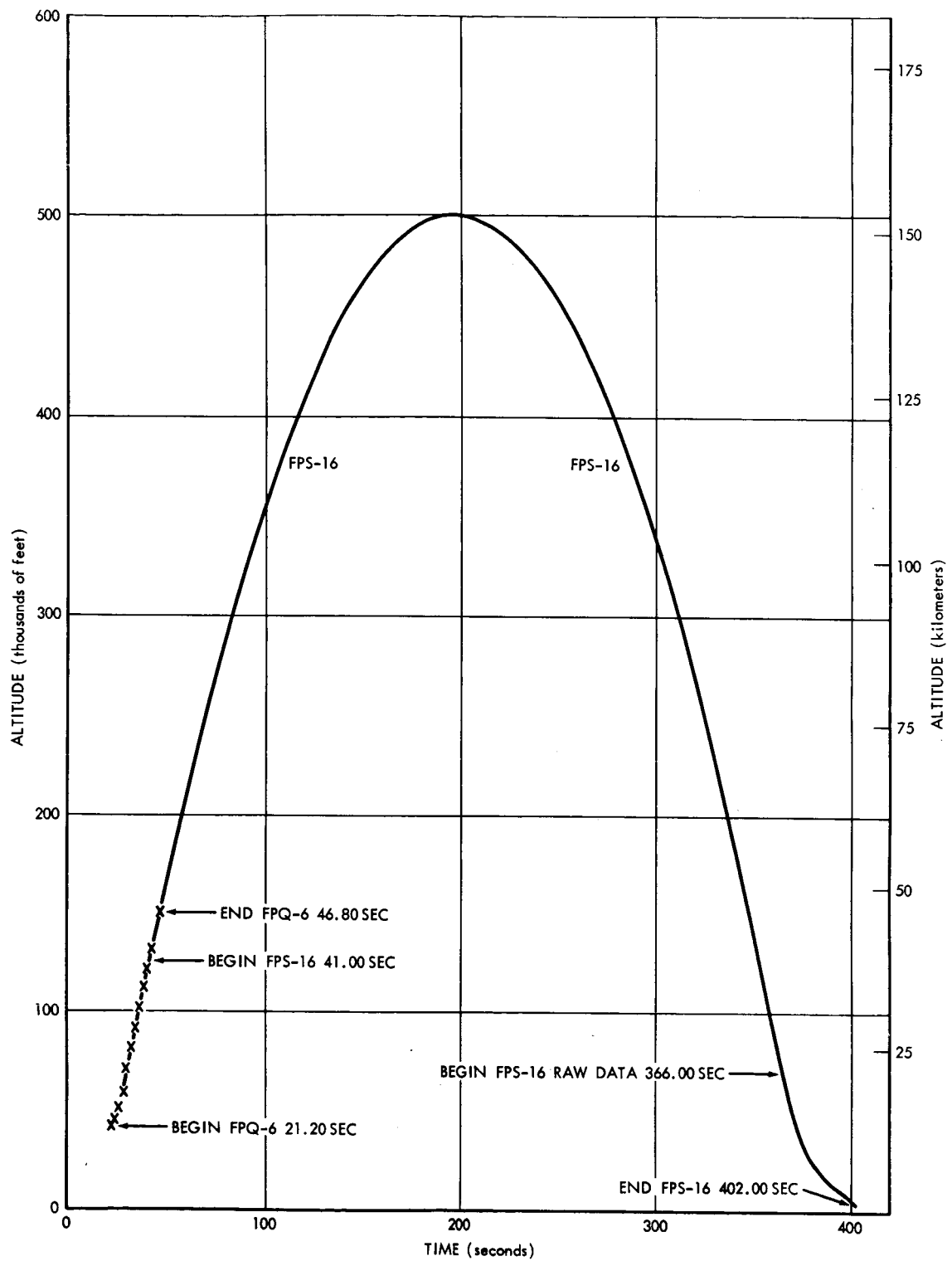


Figure 37. 14.214UI Radar Plot, Altitude vs Time

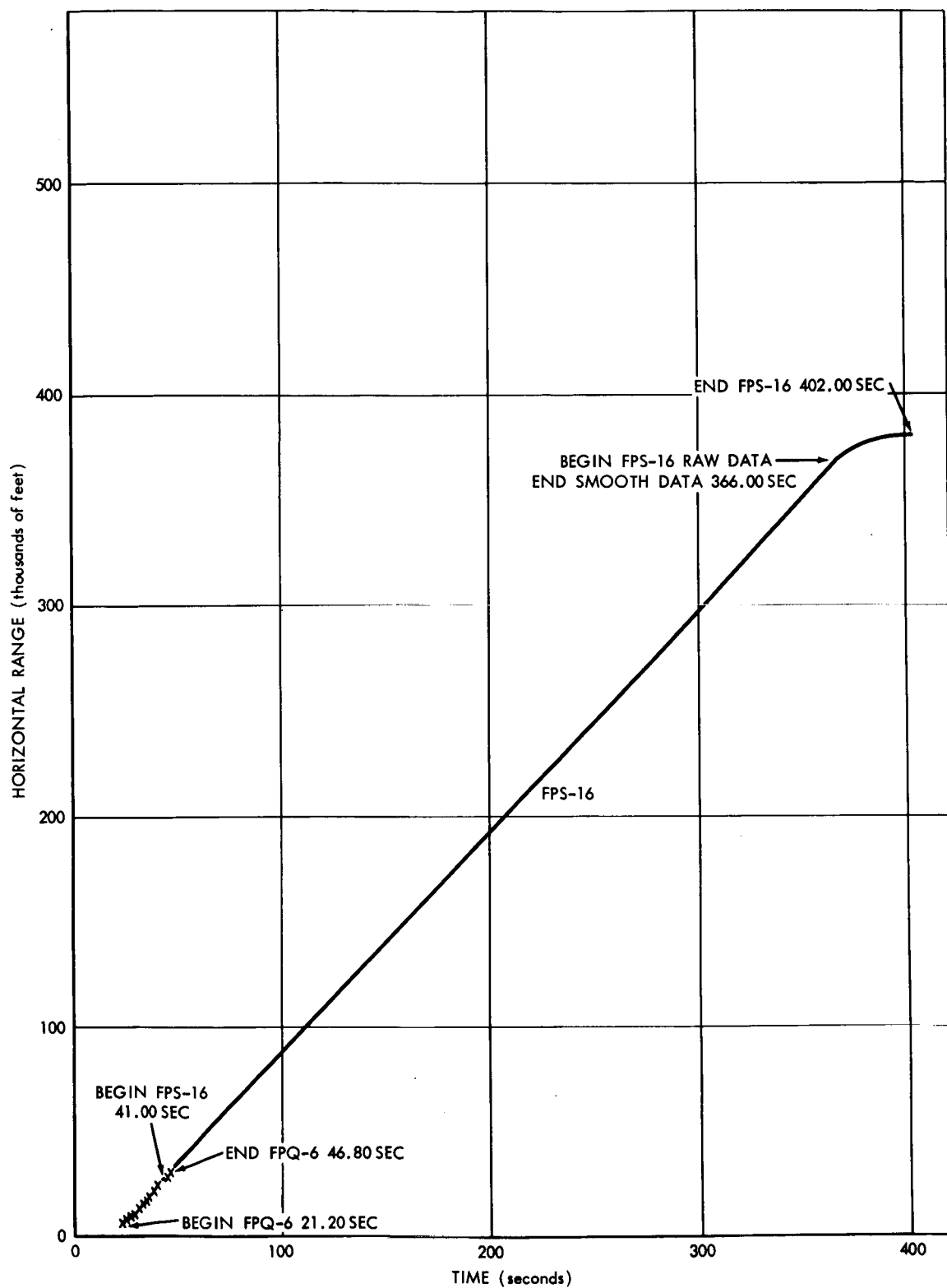


Figure 38. 14.214 UI Radar Plot, Horizontal Range vs Time

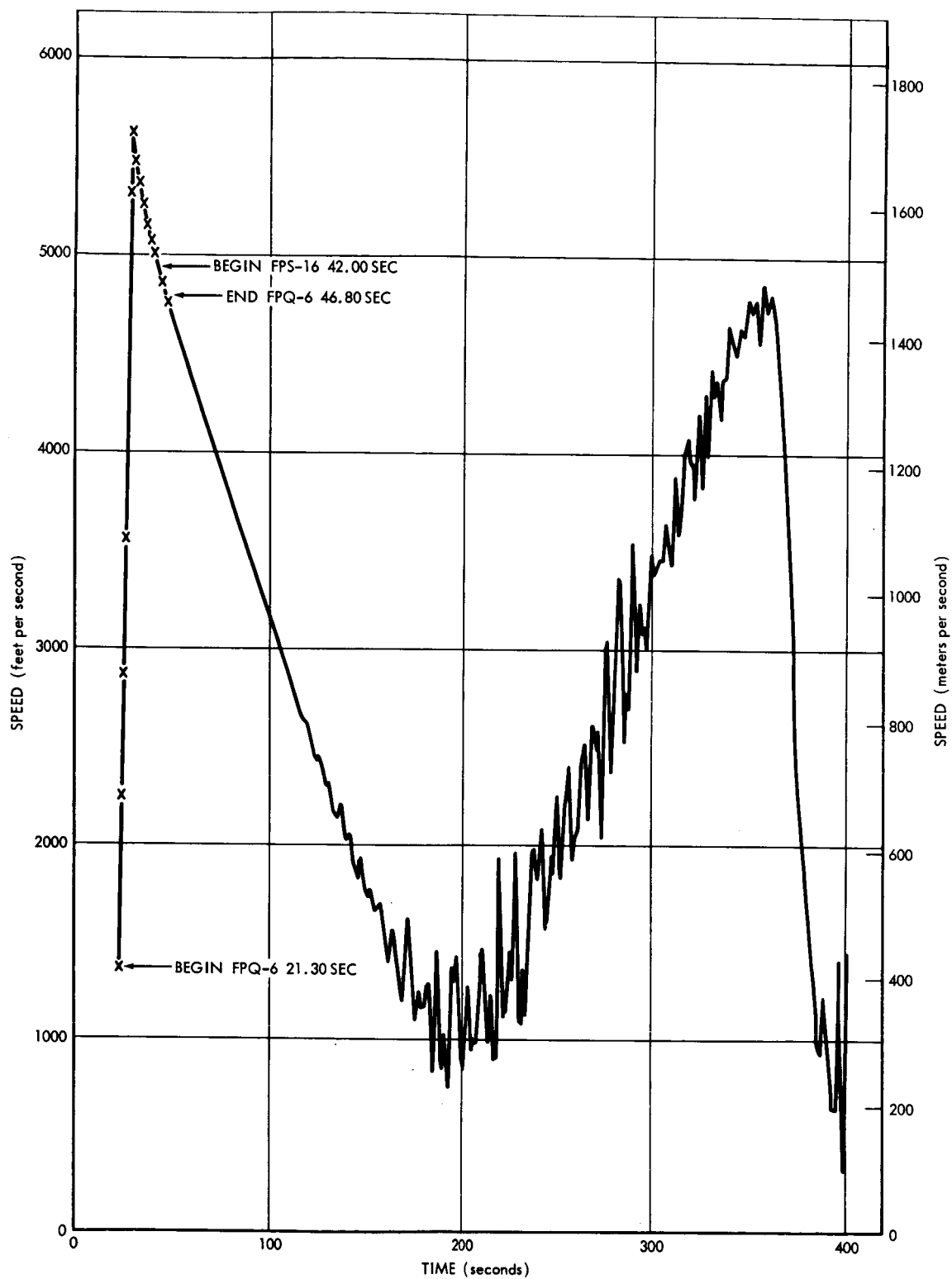


Figure 39. 14.214 UI Radar Plot, Speed vs Time

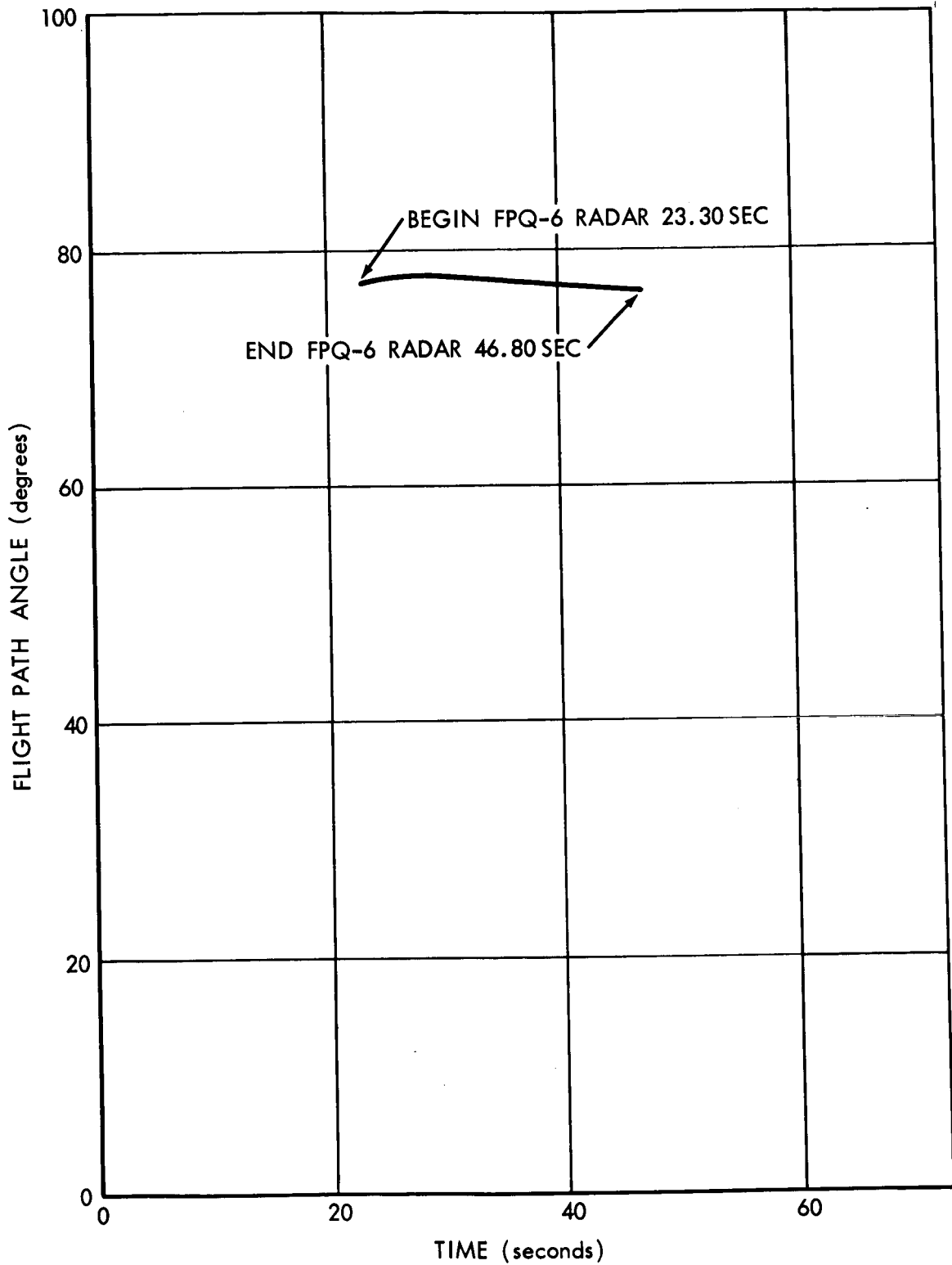


Figure 40. 14.214UI Radar Plot, Flight Path Angle vs Time

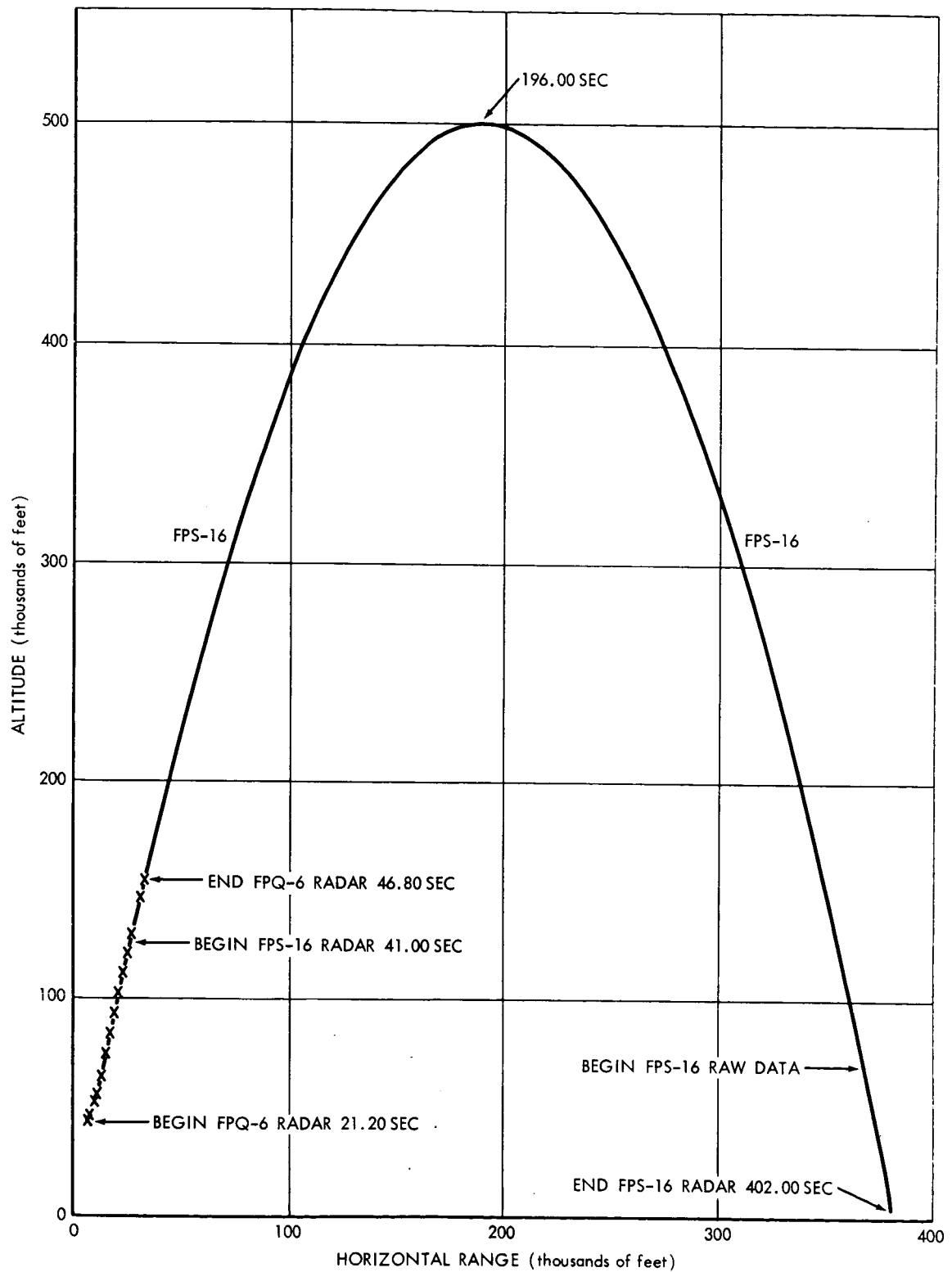


Figure 41. 14.214UI Radar Plot, Altitude vs Horizontal Range

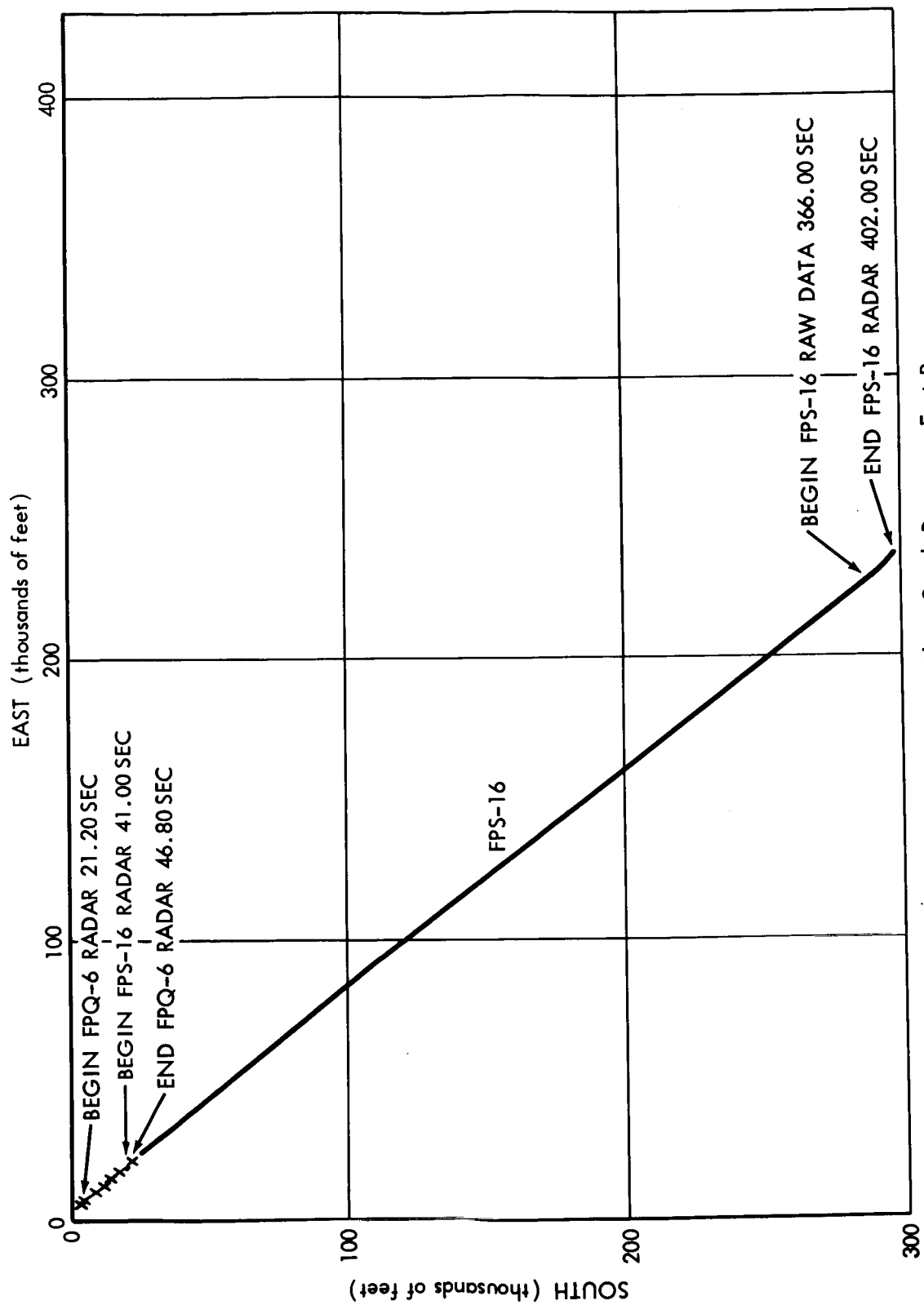


Figure 42. 14.214UI Radar Plot, South Range vs East Range

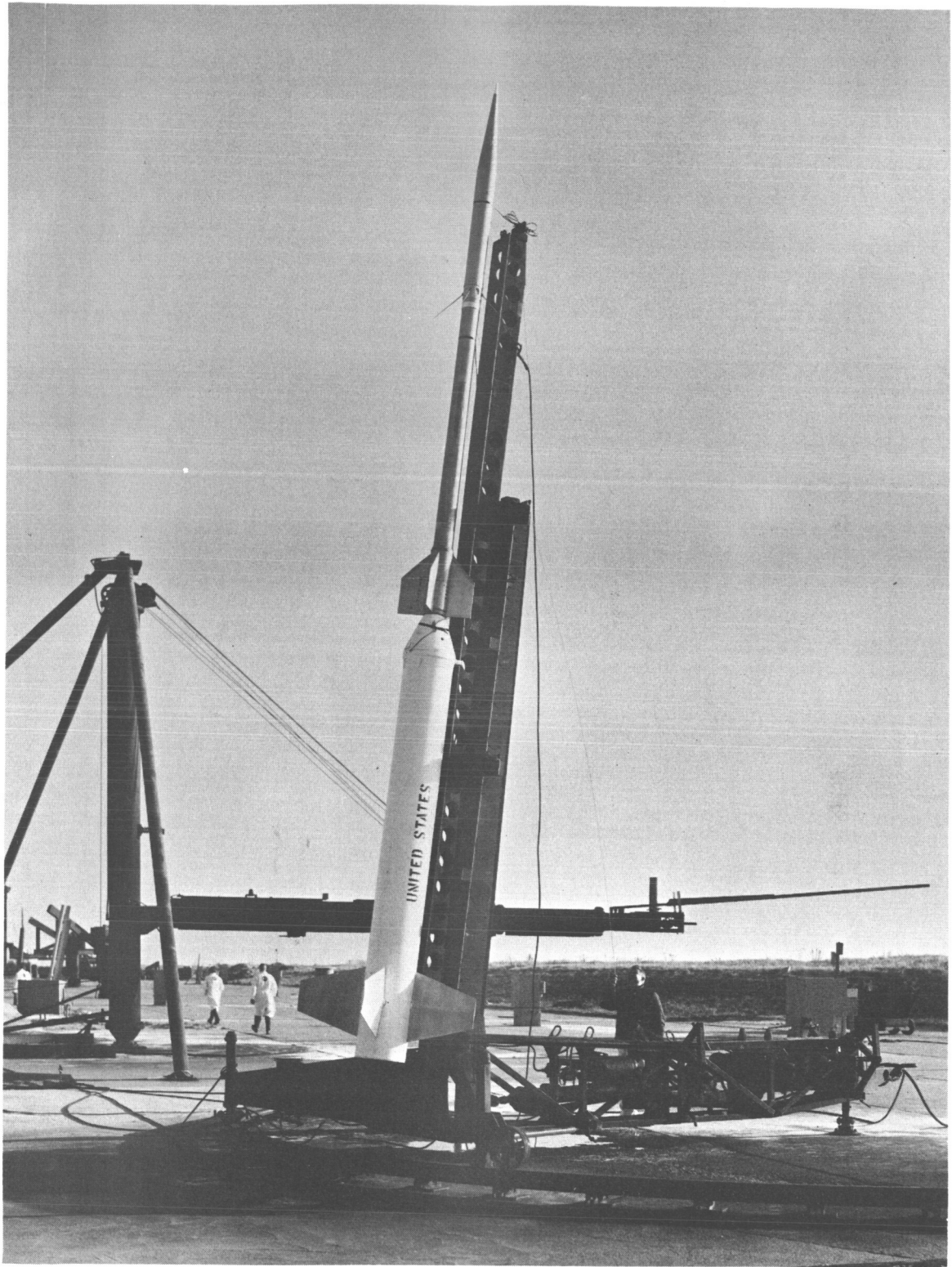


Figure 43. 14.242 UE Photograph

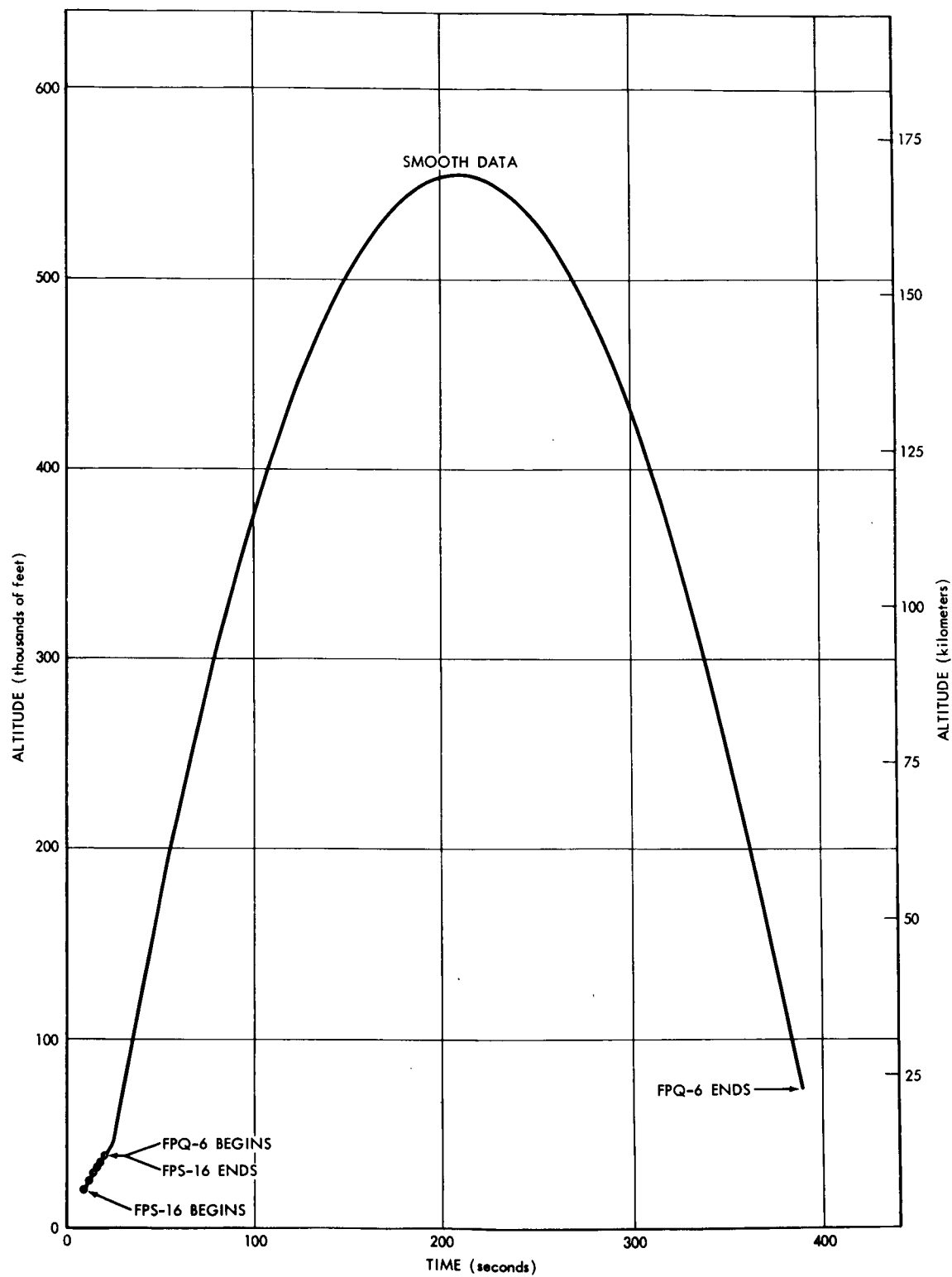


Figure 44. 14.242 UE Radar Plot, Altitude vs Time

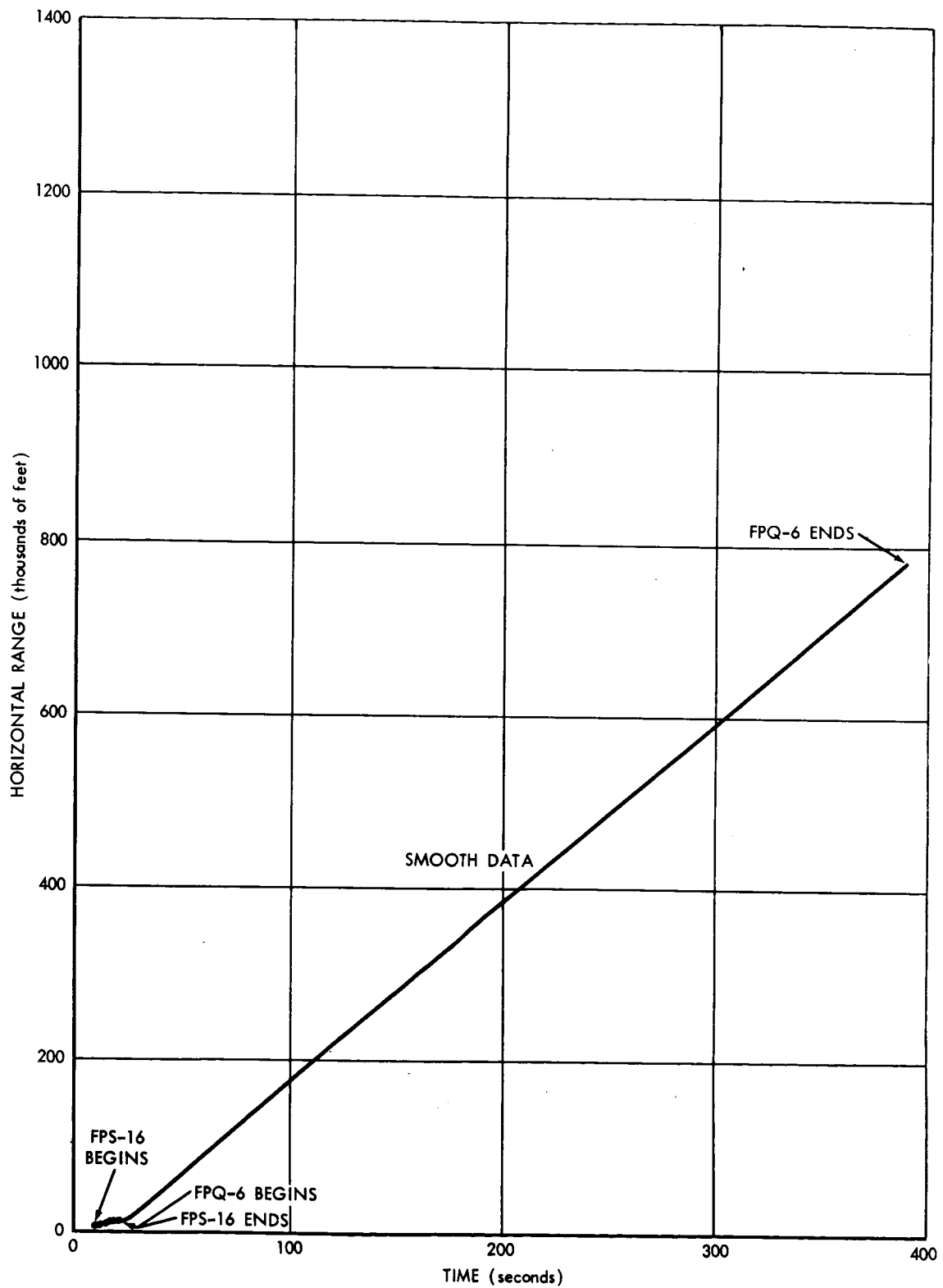


Figure 45. 14.242 UE Radar Plot, Horizontal Range vs Time

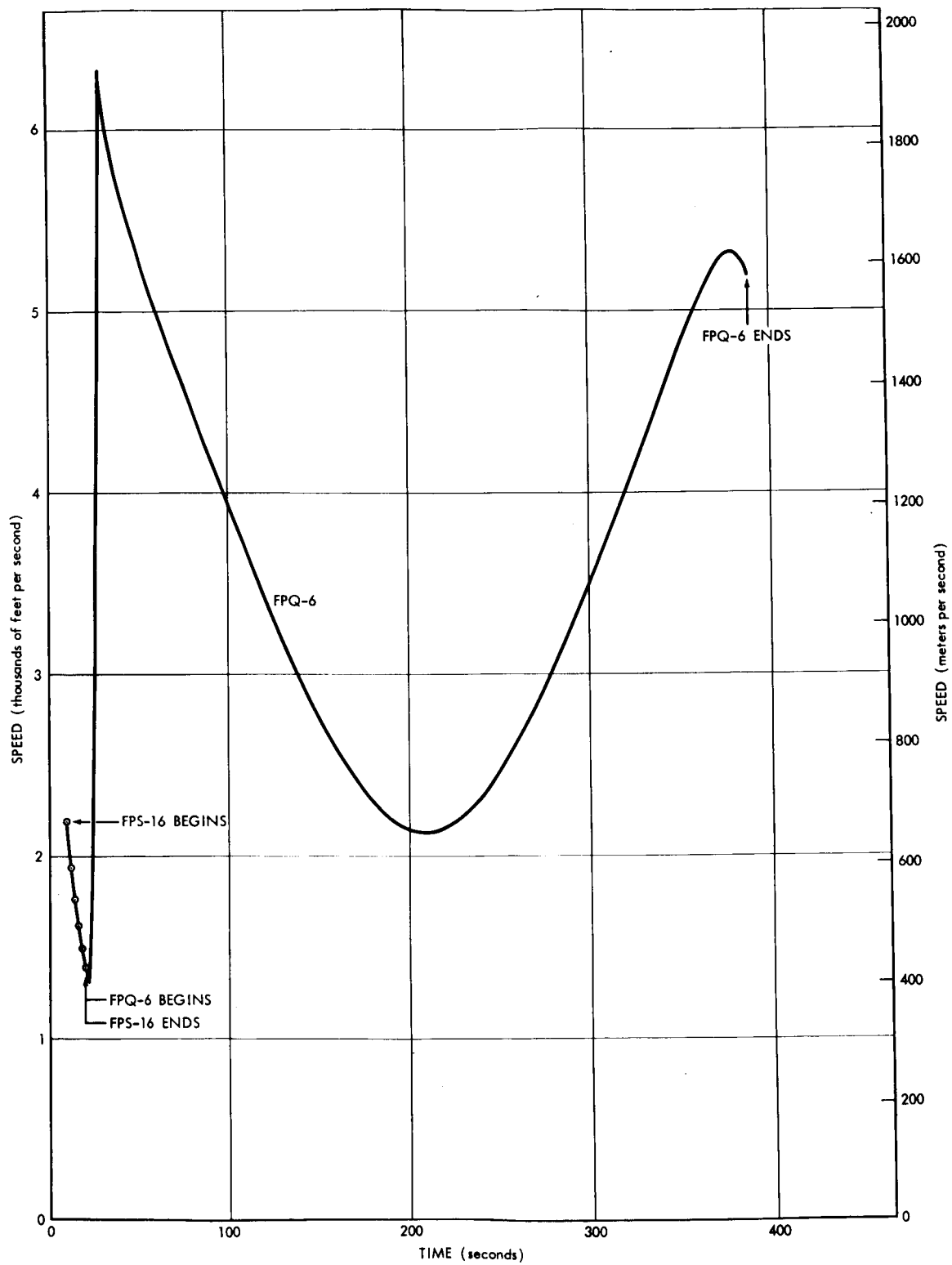


Figure 46. 14.242 UE Radar Plot, Speed vs Time

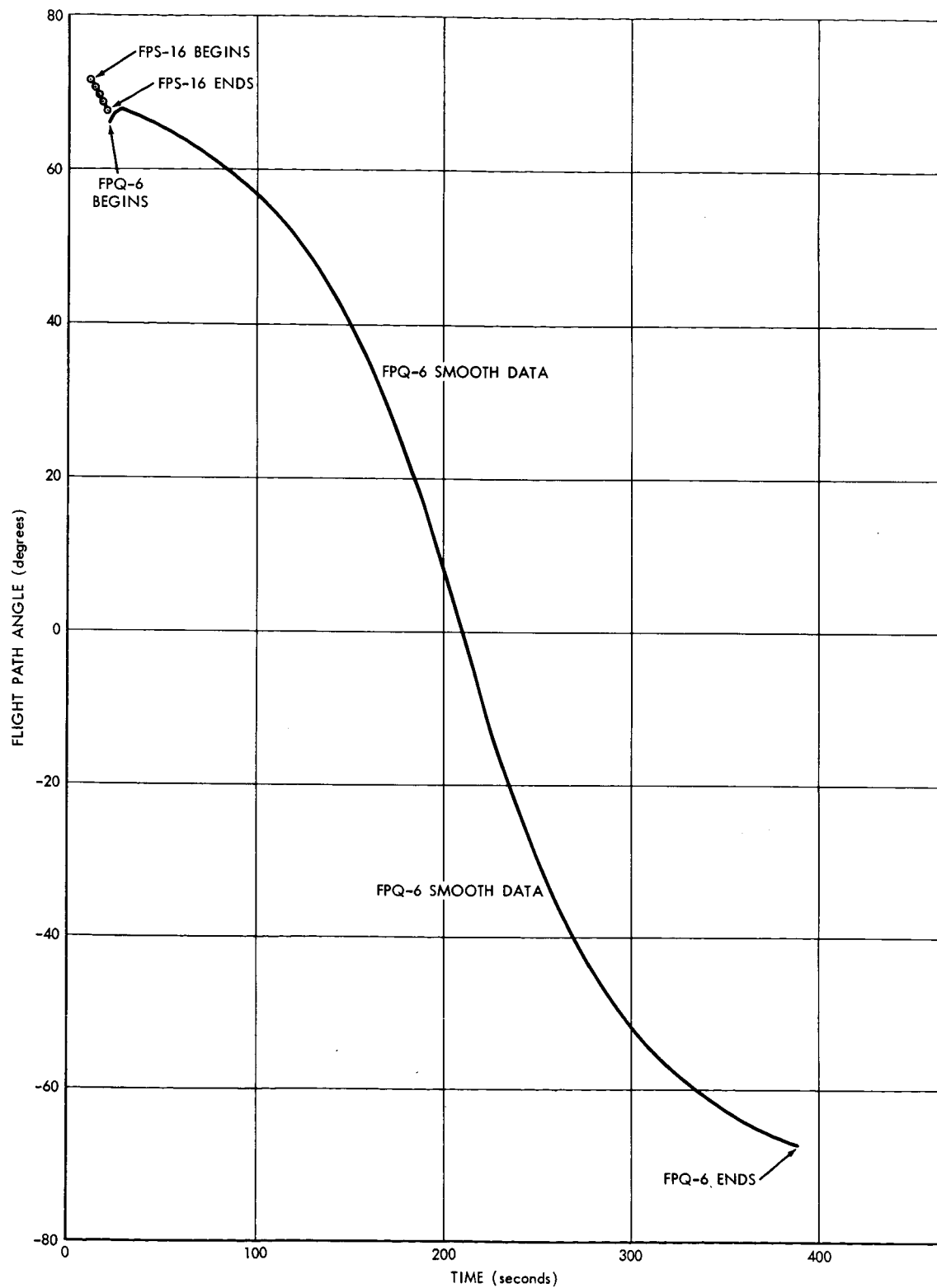


Figure 47. 14.242 UE Radar Plot, Flight Path Angle vs Time

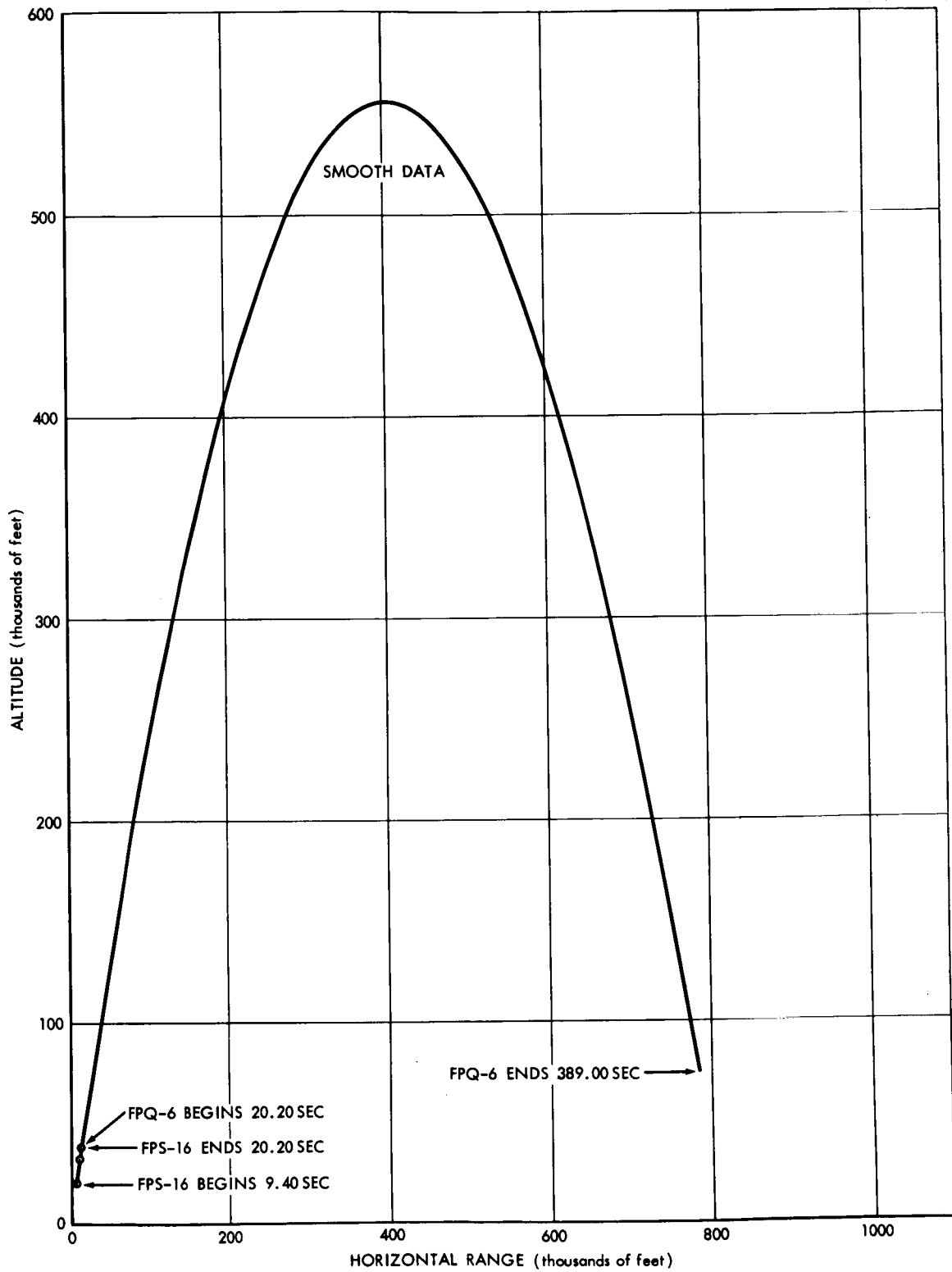


Figure 48. 14.242 UE Radar Plot, Altitude vs Horizontal Range

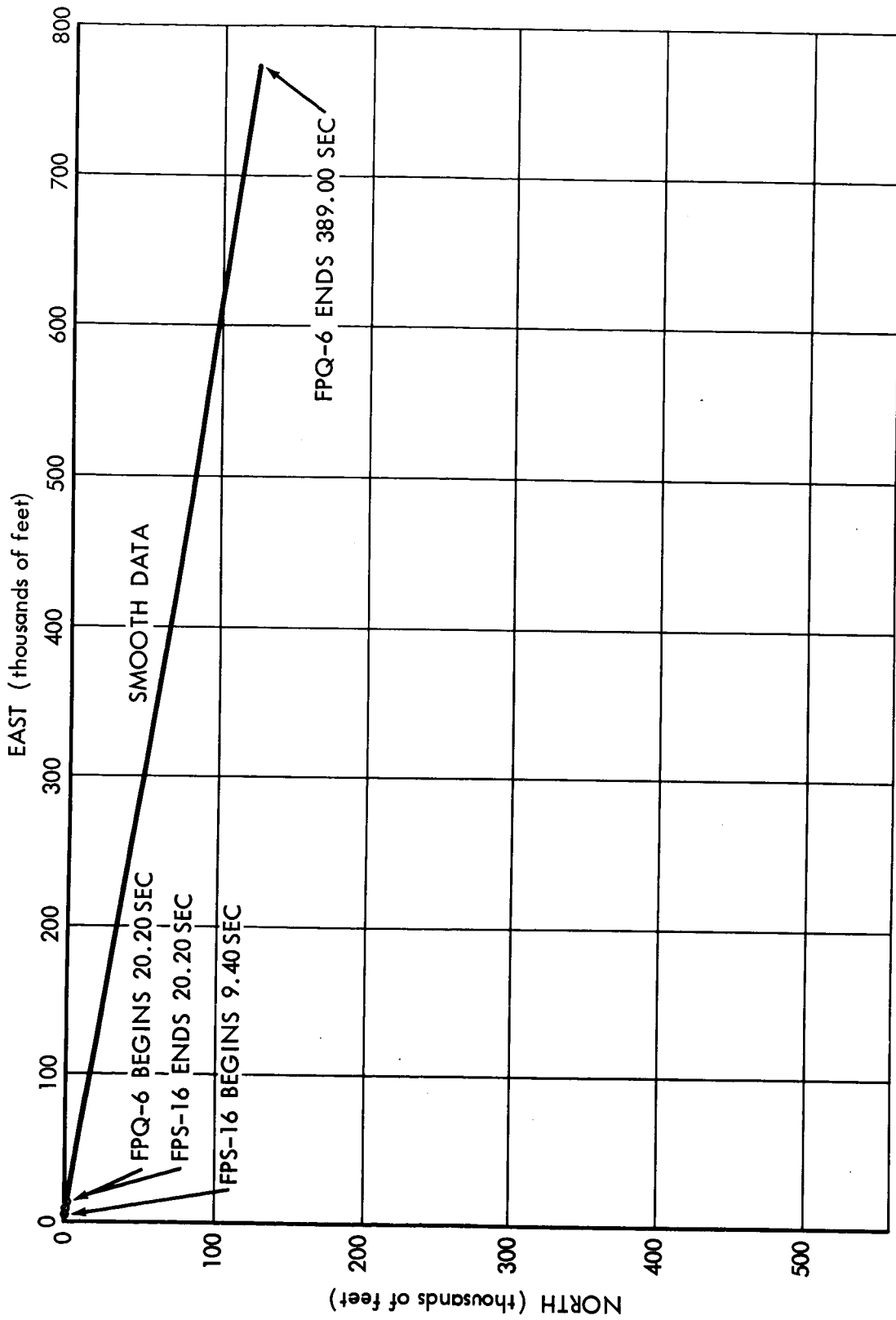


Figure 49. 14.242 UE Radar Plot, North Range vs East Range

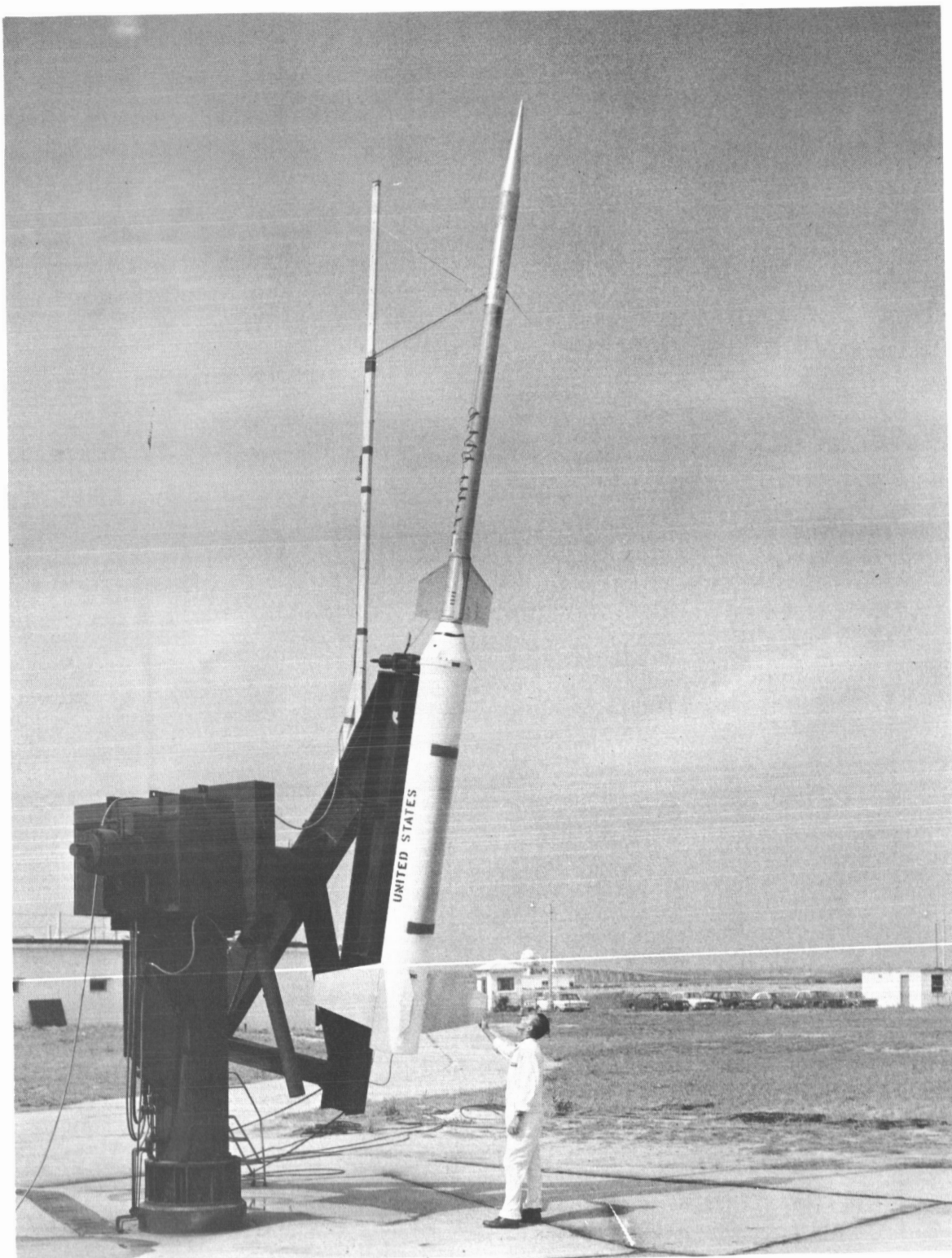


Figure 50. 14.244 UI Photograph

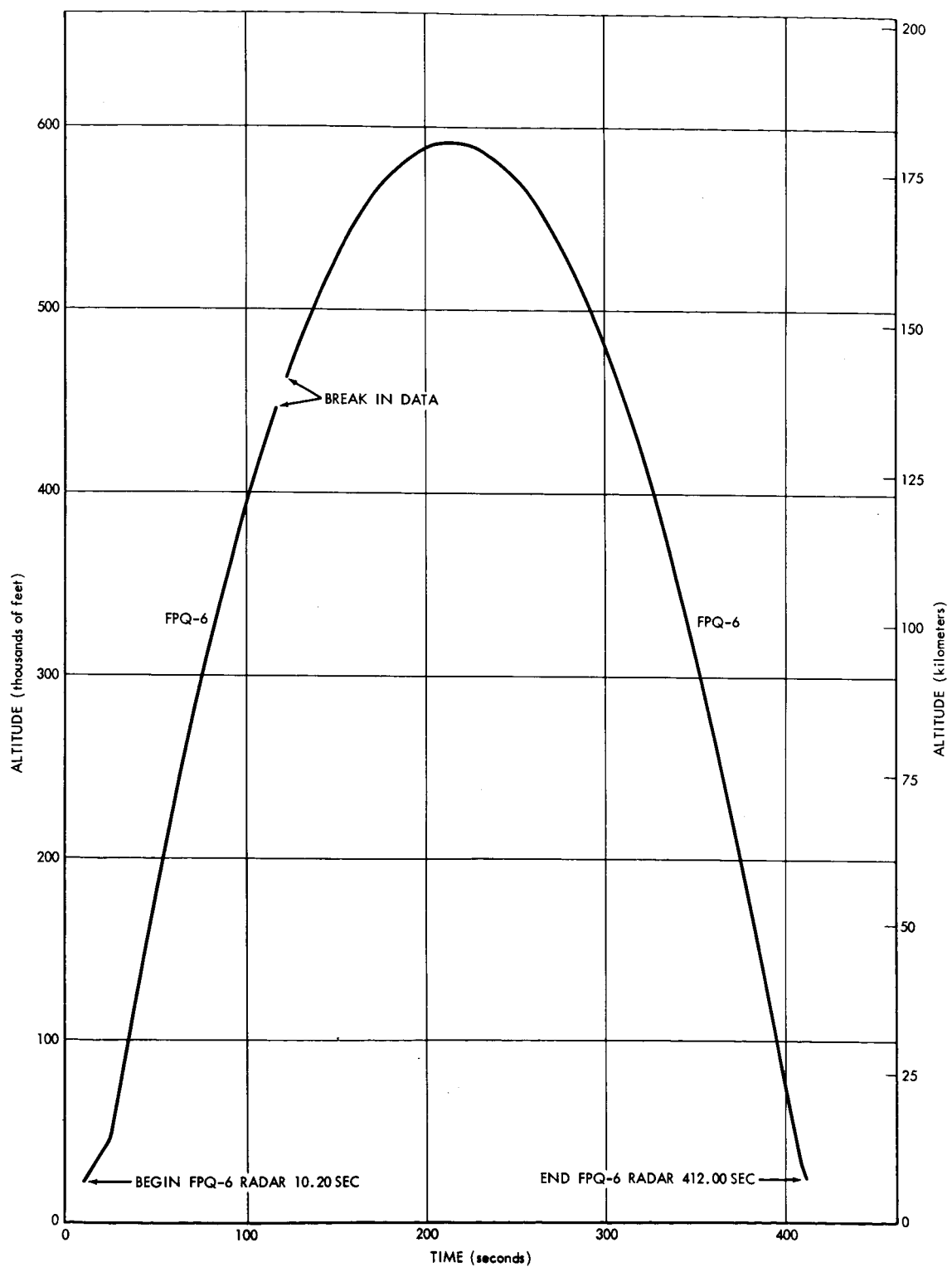


Figure 51. 14.244UI Radar Plot, Altitude vs Time

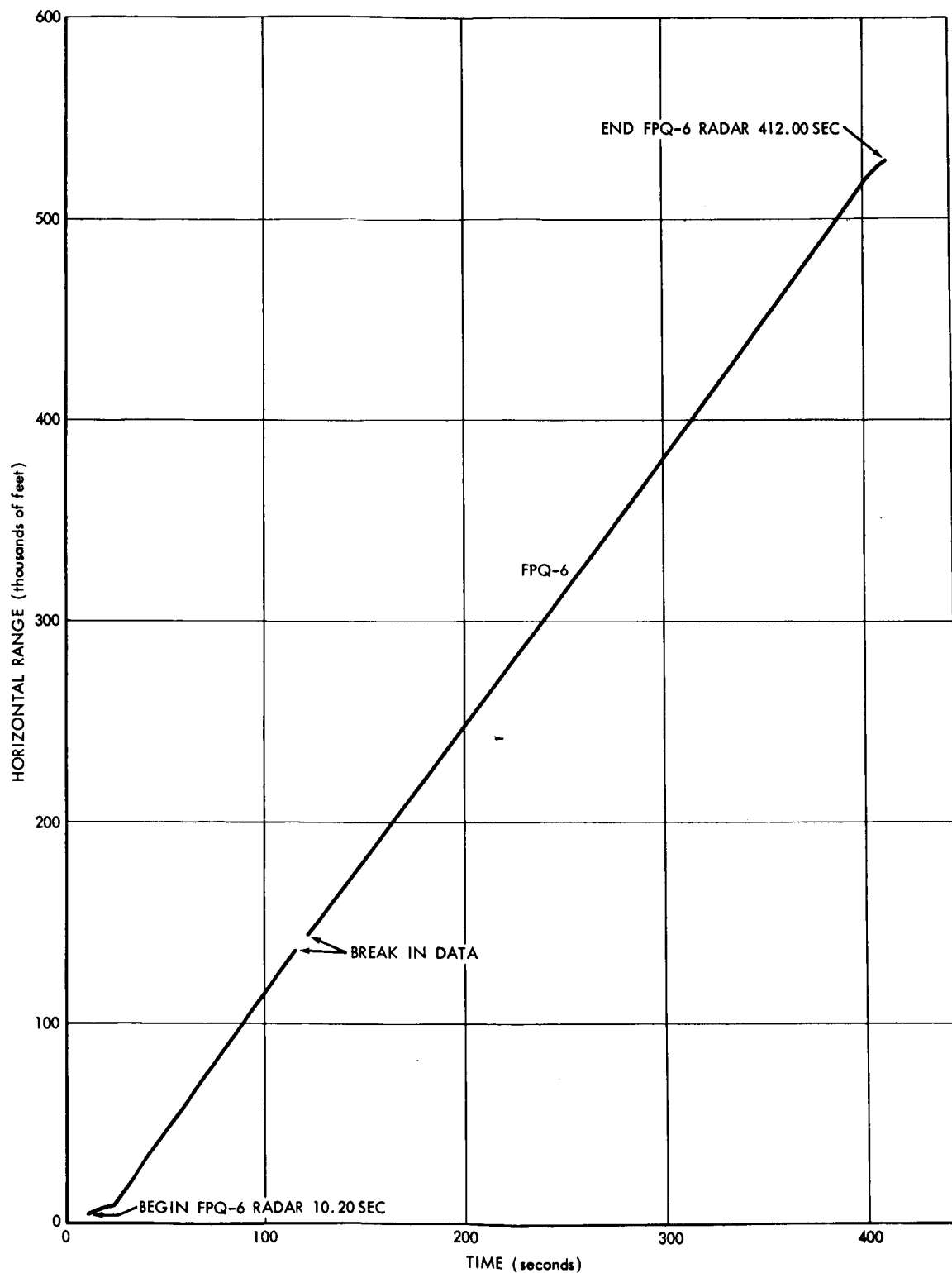


Figure 52. 14.244 UI Radar Plot, Horizontal Range vs Time

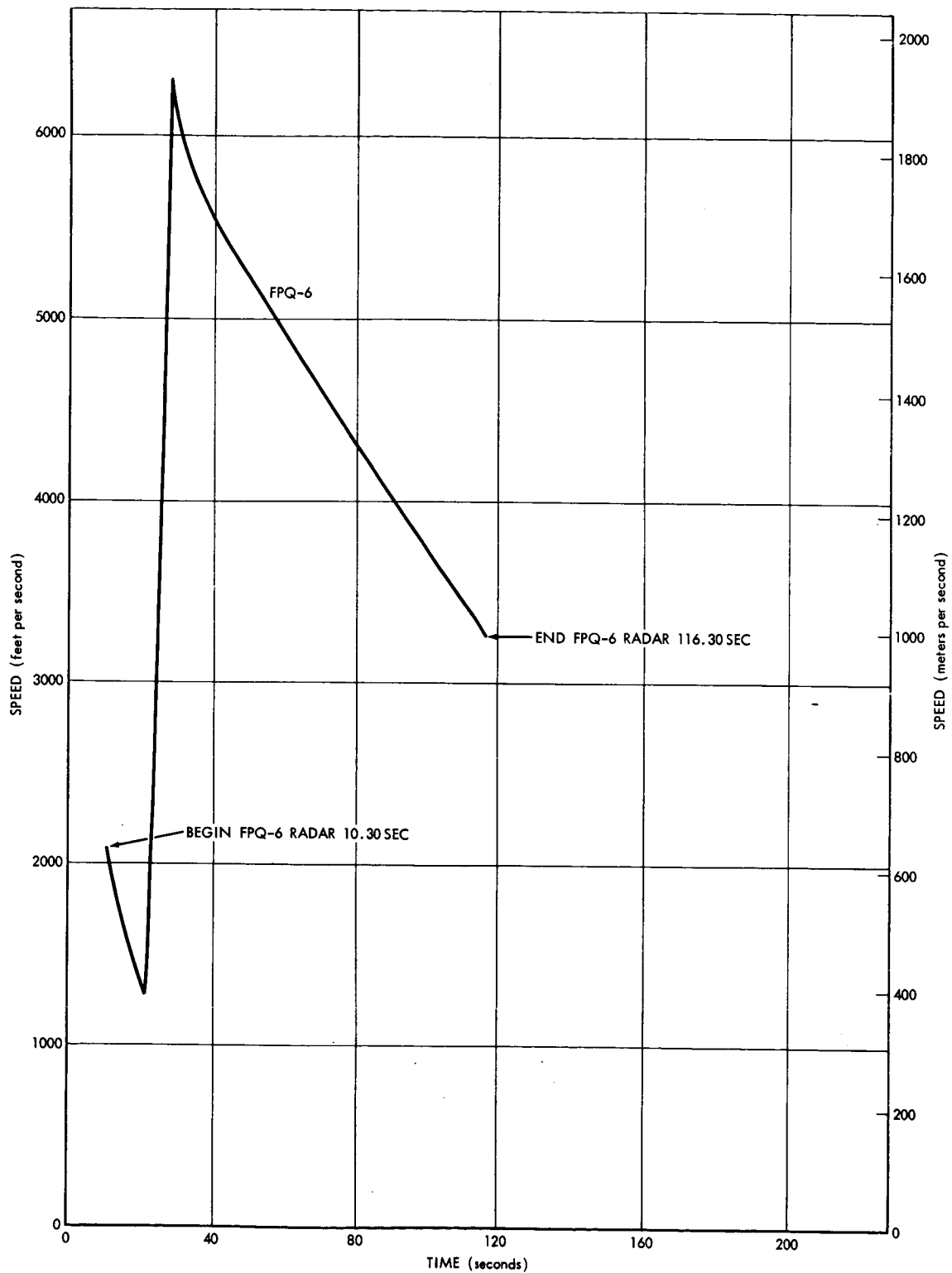


Figure 53. 14.244UI Radar Plot, Speed vs Time

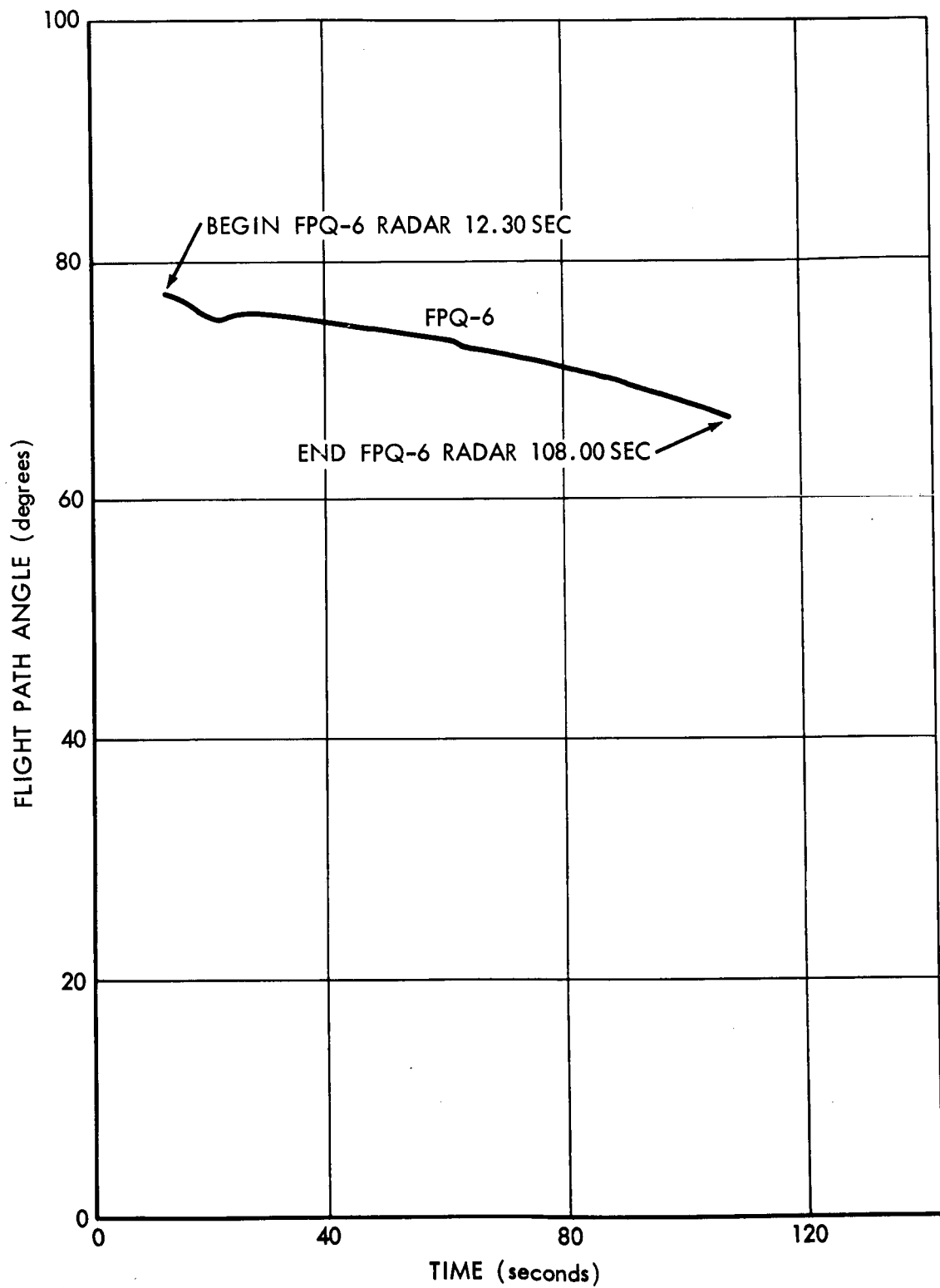


Figure 54. 14.244UI Radar Plot, Flight Path Angle vs Time

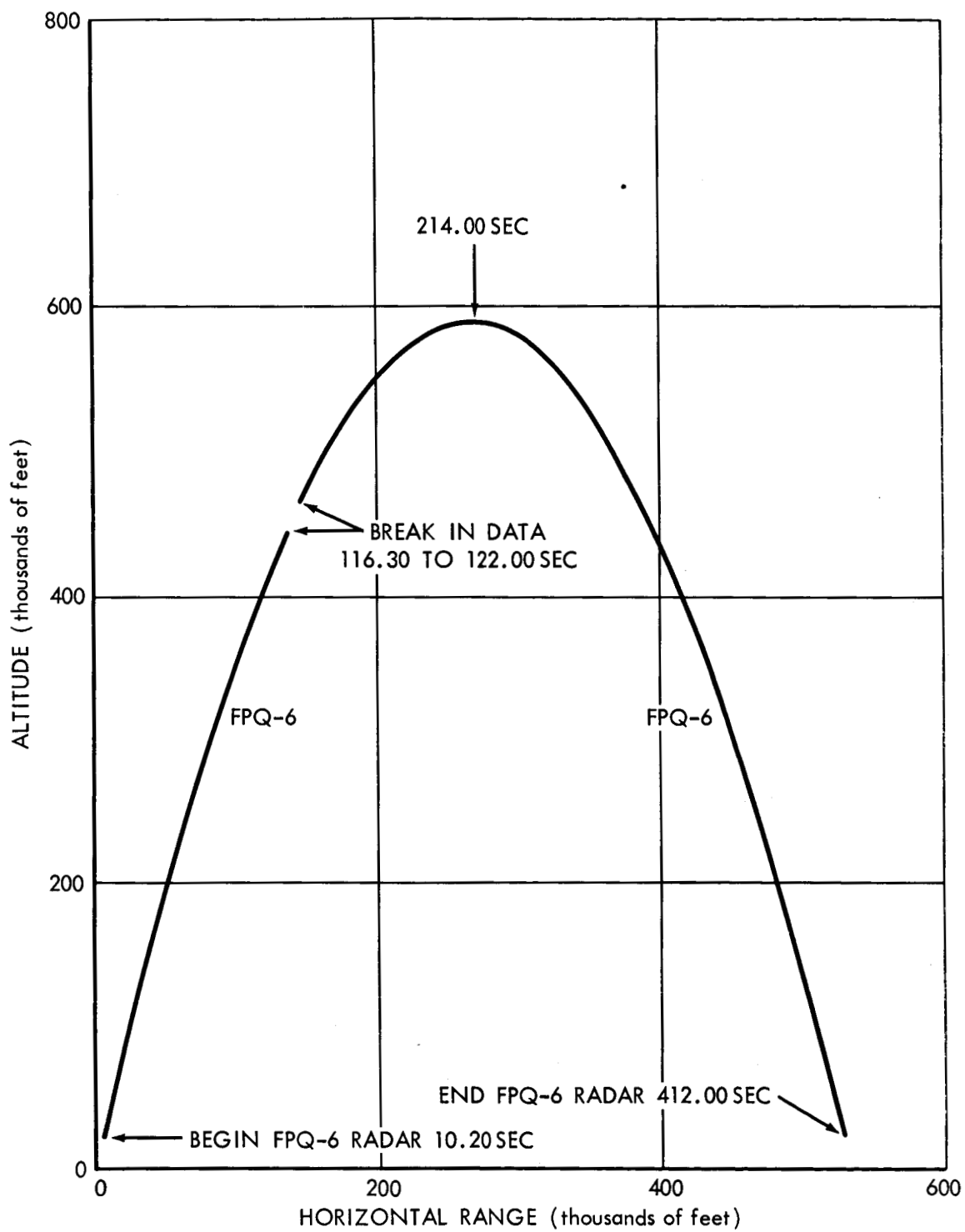


Figure 55. 14.244UI Radar Plot, Altitude vs Horizontal Range

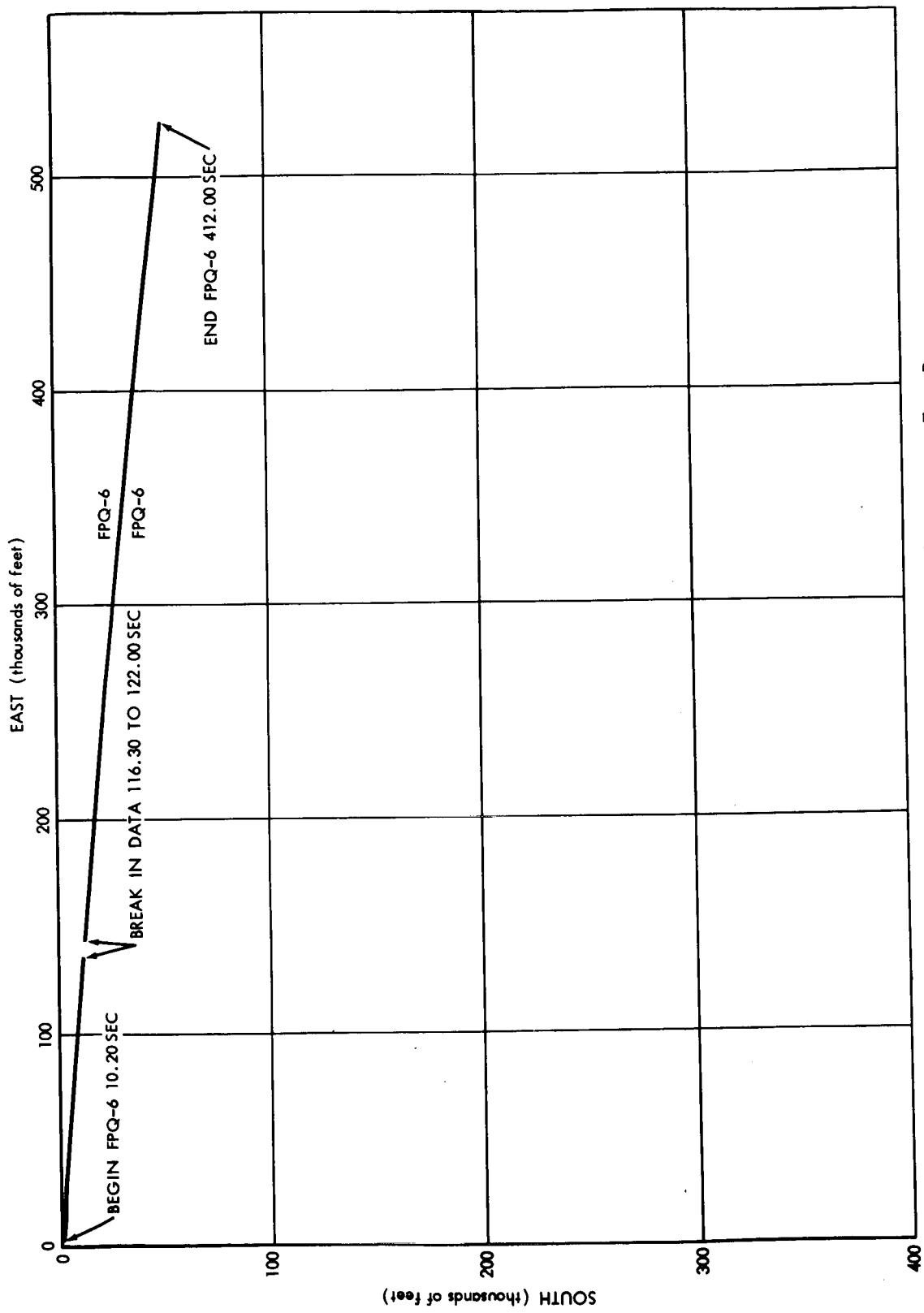


Figure 56. 14.244 UI Radar Plot, South Range vs East Range

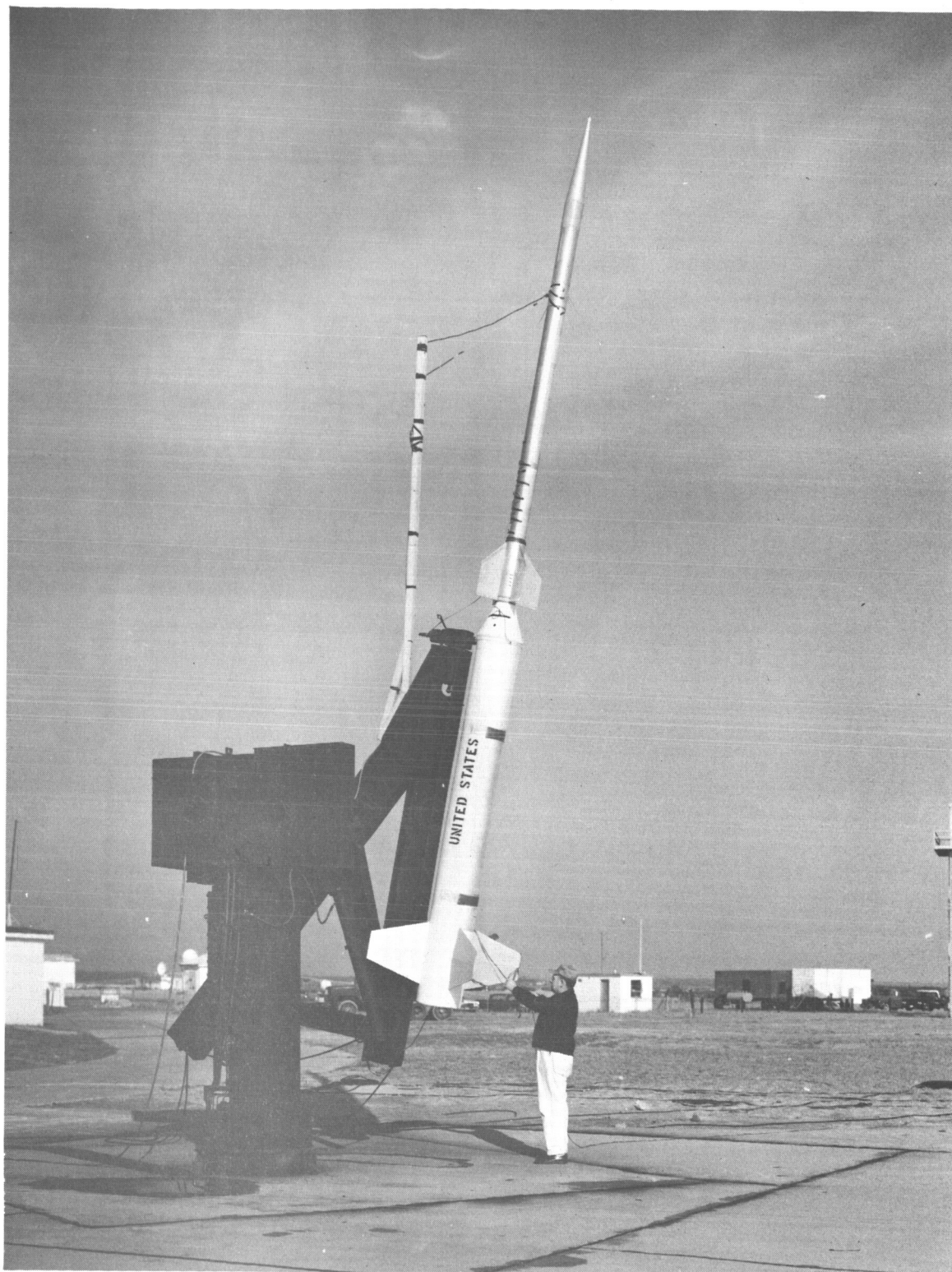


Figure 57. 14.247 UI Photograph

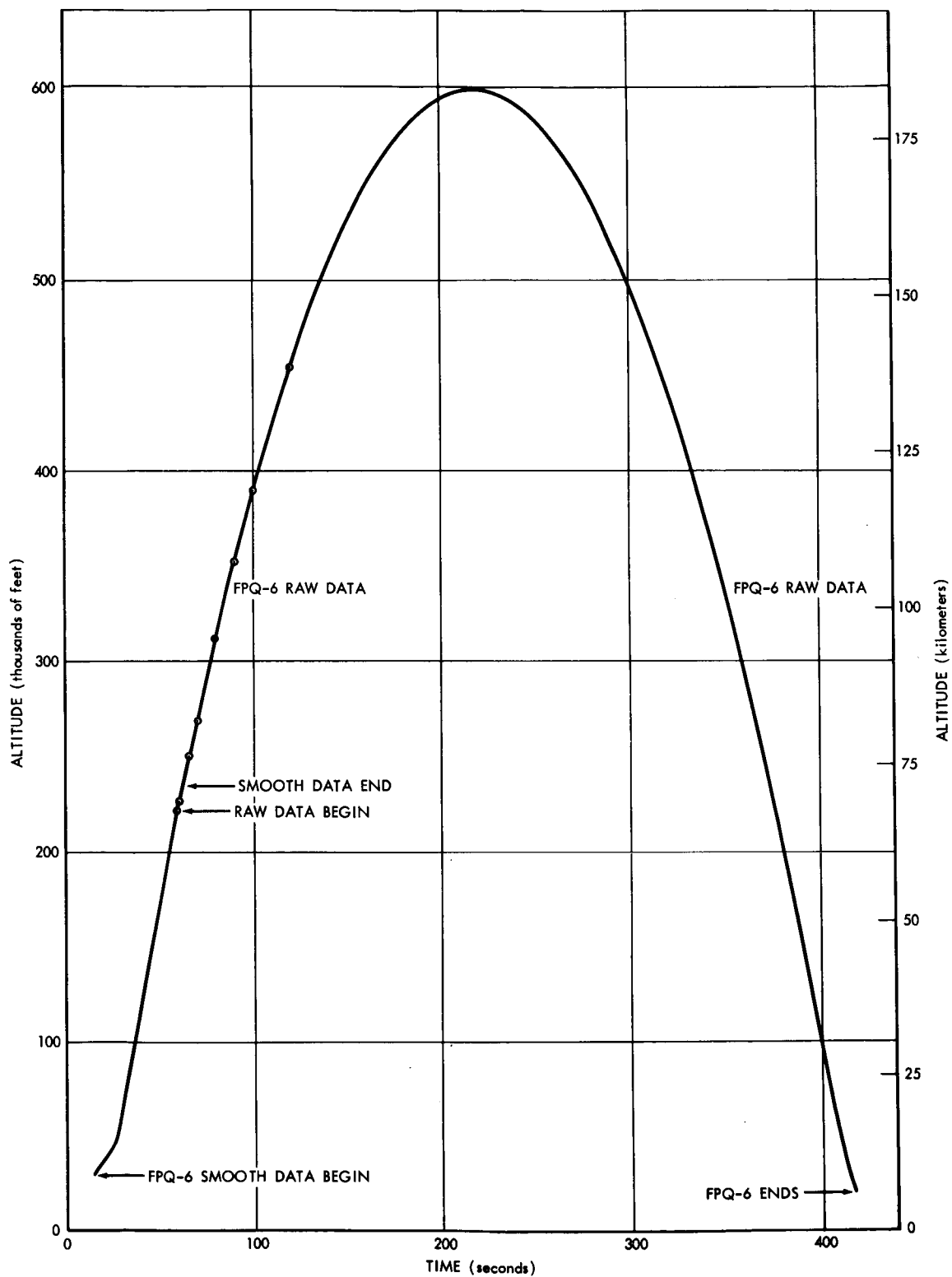


Figure 58. 14.247 UI Radar Plot, Altitude vs Time

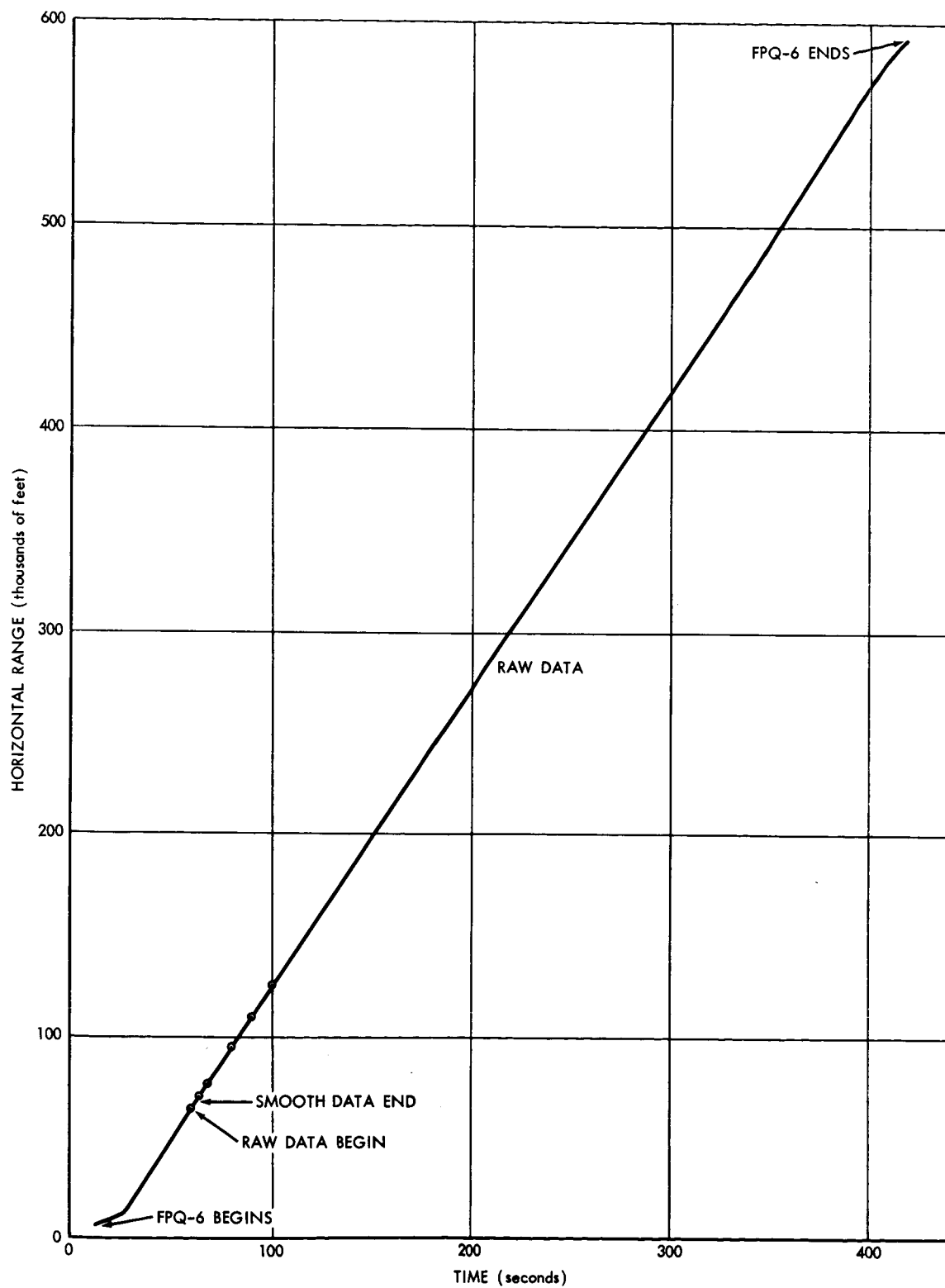


Figure 59. 14.247 UI Radar Plot, Horizontal Range vs Time

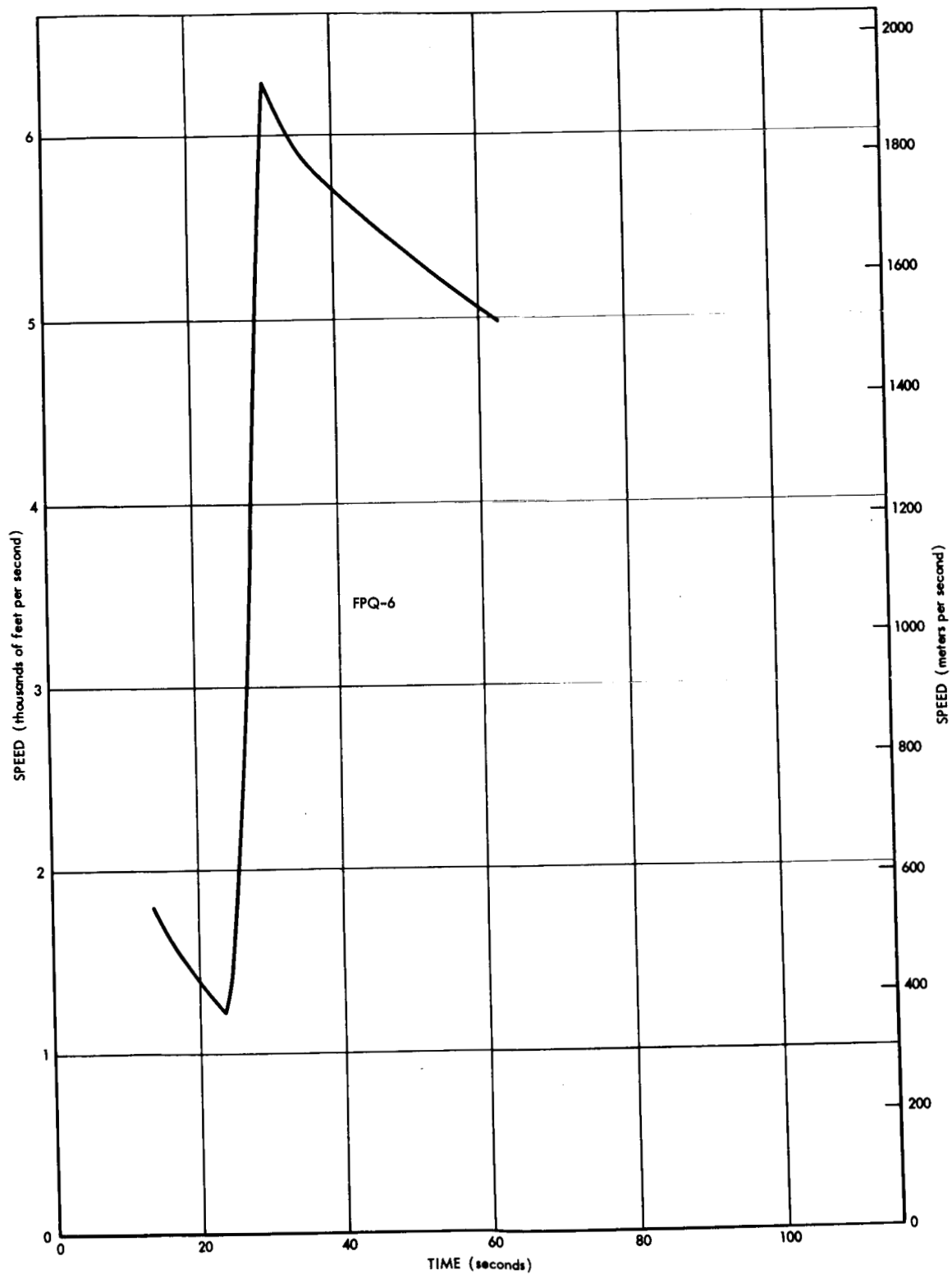


Figure 60. 14.247 UI Radar Plot, Speed vs Time

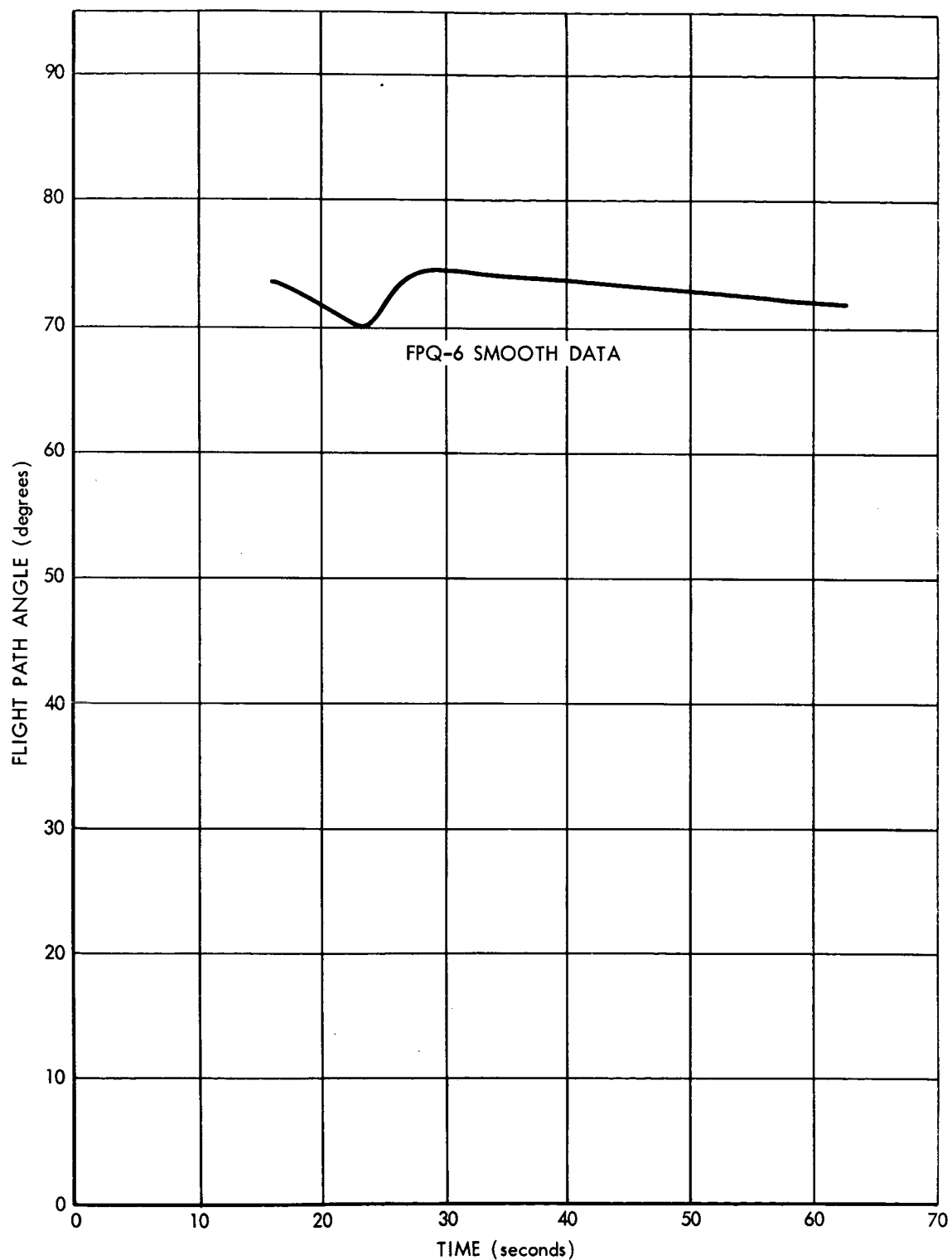


Figure 61. 14.247 UI Radar Plot, Flight Path Angle vs Time

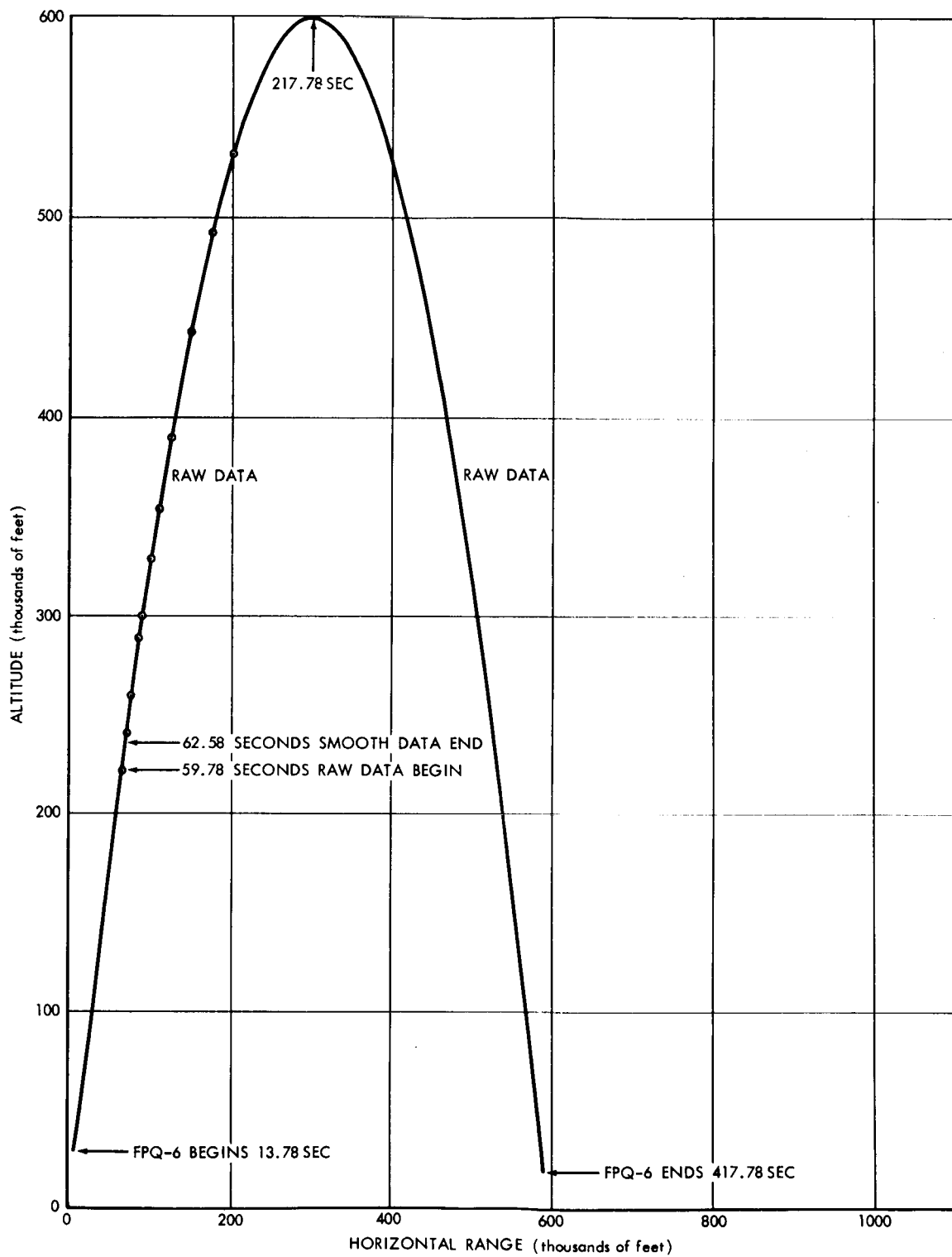


Figure 62. 14.247 UI Radar Plot, Altitude vs Horizontal Range

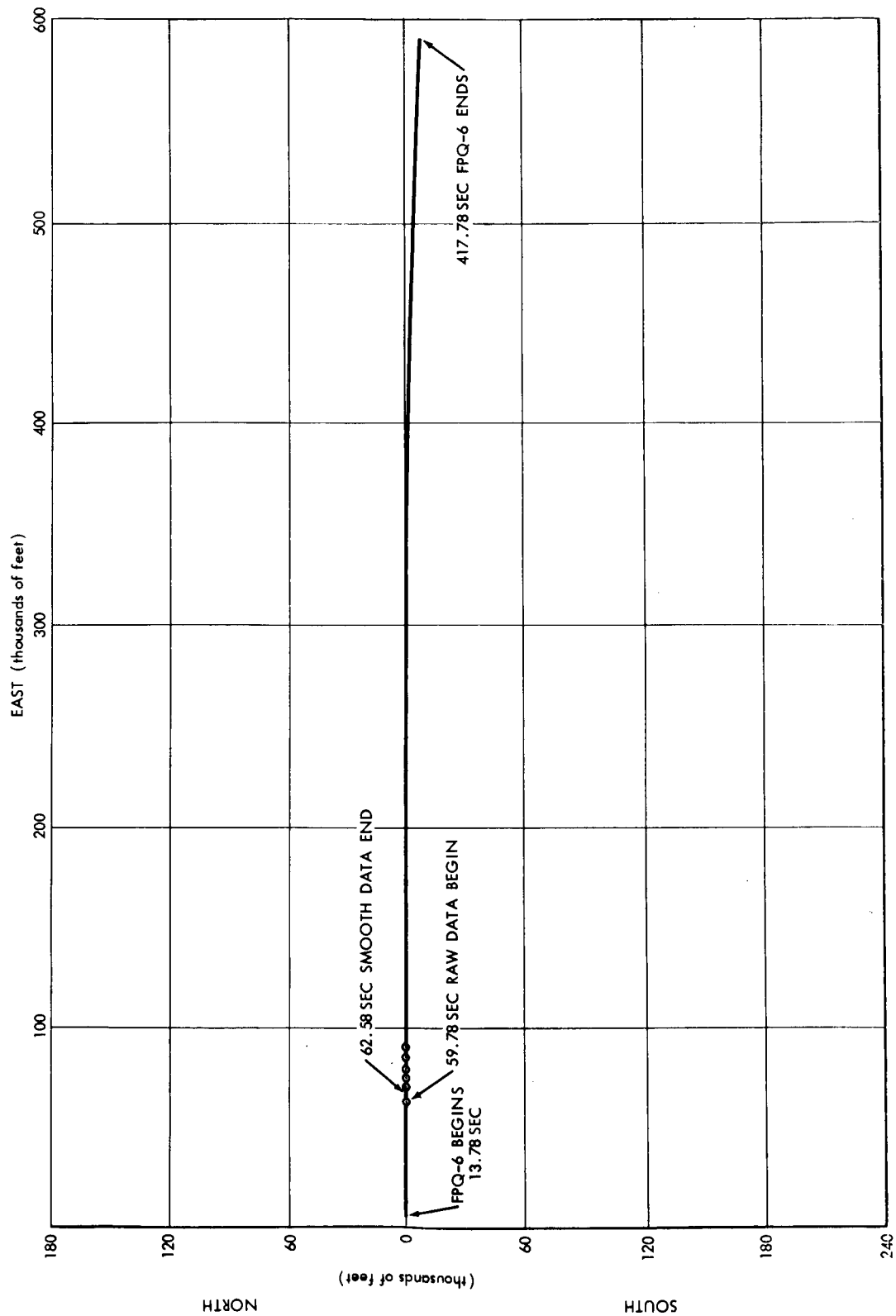


Figure 63. 14.247 UI Radar Plot, North-South Range vs East Range